No. : SM-E3307-0A

Date: 1988 - 9

FURUNO

SERVICE MANUAL

MARINE RADAR

FR-1505D(DA)
FR-1510D(DA)
MODEL FR-1525D(DA)

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

880950KO(8809,yoha)
PRINTED IN JAPAN

FURUNO Information

No. : FQ3-90-004 (1/4)
Date : 1990 - 2
Issued by : FURUNO ELECTRIC CO., LTD.
QUALITY CONTROL DEPARTMENT

ADDENDA No.1 to FR-1500D(A) SERIES RADAR SERVICE MANUAL, SM-E3307-0A

LIST OF MODIFICATIONS

MODEL	CIRCUIT	SYMBOL	NEW PARTS		OLD PARTS	SERIAL NO. DATE	OBJECTIVE/REMARKS
			NAME/SPECIFICATIONS	CODE NO.			
FR-1500DA series	IF pcb IF-5568	C650	Deleted		ECC-W1H150JR5	Nov. 1987	To improve picture on short range.
FR-1500D/DA series	SPU pcb 03P6977	U98	PROM0357055101	008-104-650	PROM0357055100		PROM change. To change heading mark brilliance.
	PWR SUPPLY PTU-6982	C8, C10, C12	ECEA1CU221 220μF, 16V	000-201-649	ECEA1CU221E	Sept. 1988	Mechanical change.
	CRT DISPLAY	VR41 R404	EVM31GA00B23 2kΩ 2.2kΩ, 1/4W		EVM31GA00B13 1.8kΩ, 1/4W		To improve accuracy of "H-HOLD" adjustment.
	SPU pcb 03P6977	U15 U15	PROM0357053105 PROM0357054106	008-102-870 008-105-110	PROM0357053104 PROM0357054105		For regular type. For N-type. Refer to Furuno Info. FQ3-88-029.
	PANEL pcb 03P6978	VR7	EVM-MCGA01B34 30kΩ	000-103-610	EVM-MCGA01B24	Nov. 1988	To widen range for TX timing adjustment.
	INTERFACE 03P6980	R5, R6 C8, C9	ERD-25PJ470 47Ω, 1/4W ECC-W1H050CC5 5pF, 50V	000-330-325 000-256-450	ERD-25TJ820 Newly added		To increase buffer current for monitor and to prevent oscillation. See Fig. 1.
		C10	RPE113R474K50 0.47μF, 50V	000-105-385	Newly added		To reject noise on bearing signal. See Fig. 1.
	PANEL pcb 03P6978	R8 VR10	ERD-25PJ332 3.3kΩ, 1/4W EVM-MCGA01B24 20kΩ	000-330-369 000-103-591	ERD-25PJ103 EVM-MCGA01B14	Dec. 1988	To change STC range.

LIST OF MODIFICATIONS

MODEL	CIRCUIT	SYMBOL	NEW PARTS		OLD PARTS	SERIAL NO. DATE	OBJECTIVE/REMARKS
			NAME/SPECIFICATIONS	CODE NO.			
FR-1500D/DA series	PANEL pcb 03P6978	R6	ERD-25PJ102 1kΩ, 1/4W	000-330-357	ERD-25PJ222	Dec. 1988	To change preset gain voltage.
		VR9	EVM-MCGA01B53 5kΩ	000-103-631	EVM-MCGA01B23		
	CRT DISPLAY	C141	RPE132CH561J50 560pF		ECQM1H102KVW		To improve picture quality. Refer to Furuno Info. FQ3-89-002.
FR-1500D series	STC pcb STC-6995B	C713	RPE132CH101J50 100pF, 50V	000-104-505	Newly added	Jan. 1989	To eliminate ring of noise at about 24nm. See Fig. 2.
		C728	DD104B102K50V 1000pF, 50V	000-252-171	〃		
		R729	ERD-25PJ101 100Ω, 1/4W	000-330-333	〃		
FR-1500D/DA series	PWR SUPPLY PTU-6982	C6	ECEA1CU100E 10μF, 16V	000-201-672	ECEA1CU101E		To be in common with FR-1500 DS series. See Fig. 3.
		L3, L4	SN-5-400	000-105-220	SN-3-205		
		R5	ERX-1SJR22P 0.22Ω, 1W	000-375-362	RW-1		
		R9	ERD-25TJ223 22kΩ, 1/4W	000-330-389	ERD-25TJ123		
		R22	ERX-1SJR22P 0.22Ω, 1W	000-375-362	Newly added		
		R24	ERD-25TJ393 39kΩ, 1/4W	000-330-395	Newly added		
		R25	ERD-25TJ823 82kΩ, 1/4W	000-330-403	Newly added		
		R26	ERD-25TJ152 1.5kΩ, 1/4W	000-330-361	Newly added		
		TP11	LC-2-S	000-537-970	Newly added		Test terminal for 24Vdc.

LIST OF MODIFICATIONS

MODEL	CIRCUIT	SYMBOL	NEW PARTS		OLD PARTS	SERIAL NO. DATE	OBJECTIVE/REMARKS
			NAME/SPECIFICATIONS	CODE NO.			
FR-1500D/DA series	PWR SUPPLY PTU-6982	CR8 R11	1SS82 ERD-25PJ821 820Ω, 1/4W	000-114-021 000-330-355	1S2462 ERD-25PJ122	Mar. 1989	To keep +35V line voltage within rating.
FR-1500D series	IF AMP pcb IF-4879B	PCB	IF-4879B	008-103-360	IF-4879B	June 1989	Production of ICs used on pcb was discontinued. Refer to Furuno Info. FQ 3-89-019.
		C624	ECC-W1H120JC5 12pF	000-256-418	ECC-W1H150JC5	Nov. 1989	To adjust bandwidth on short range.
FR-1500D/DA series	MOD.TRIG.pcb	R897	ERD-25PJ332 3.3kΩ, 1/4W	000-330-369	ERD-25PJ103		To keep magnetron current within rating.
FR-1500D/DA series	SPU pcb 03P6977	U15	PROM0357053108	008-400-390	PROM0357053105	Jan. 1990	For regular type.
			PROM0357054107	008-400-400	PROM0357054106		For N-type.
RP-1			PROM0357053108	008-400-390	PROM0357053105		
ARP-1			PROM0358256103	008-400-410	PROM0358256101		
FR-1500D series	IF AMP pcb IF-4879B	C657	DD104-69B102K50V 1000pF, 50V	000-253-806	Newly added	Feb. 1990	To prevent oscillation. See Fig. 4.
	STC pcb STC-6995B	C713	RPE132CH221J50 220pF, 50V	000-105-390	RPE132CH101J50		To eliminate ring of noise at about 20nm.
FR-1500D/DA series	STC pcb STC-6995A/B	C718,719 L701,702	Deleted Deleted		DD109-69E103P50V EL0710-360K		Parts are not used.

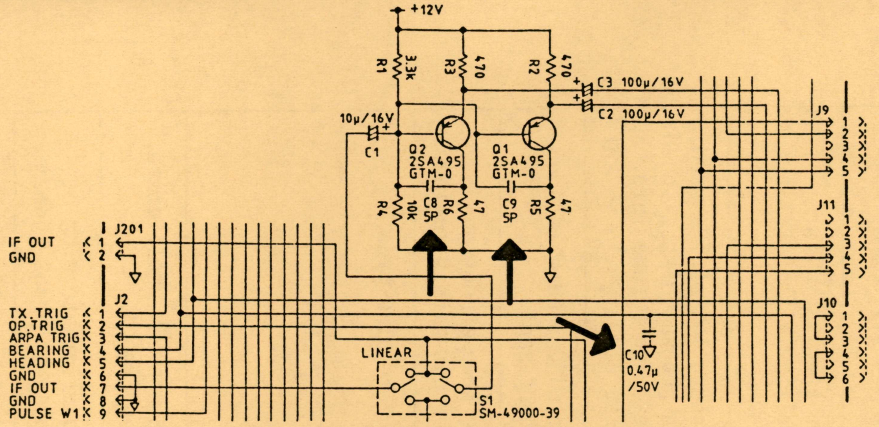

+12V
R1 3.3k
R3 470
R2 470
C3 100μ/16V
C2 100μ/16V
10μ/16V
C1
Q2 2SA495 GTM-0
Q1 2SA495 GTM-0
R4 10k
C8 5P
R6 47
C9 5P
R5 47
J9
J11
J10
IF OUT
GND
J201
J2
TX.TRIG
OP.TRIG
ARPA TRIG
BEARING
HEADING
GND
IF OUT
GND
PULSE W1
LINEAR
S1 SM-49000-39
C10 0.47μ /50V

Fig.1

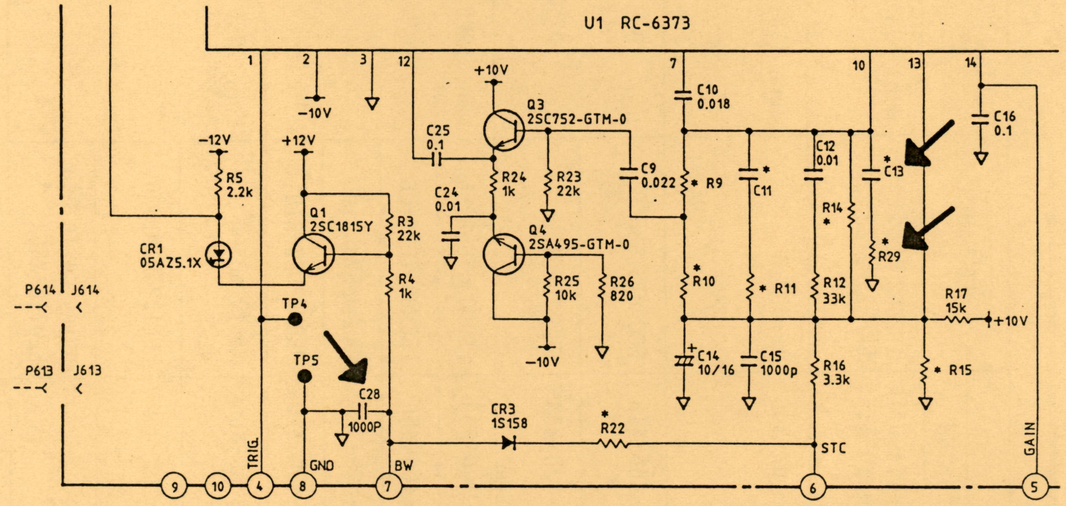

U1 RC-6373
1
2
3
12
7
10
13
14
-10V
+10V
Q3 2SC752-GTM-0
C10 0.018
C16 0.1
C25 0.1
C24 0.01
R24 1k
R23 22k
C9 0.022
R9
C11
C12 0.01
C13
R14
R29
Q4 2SA495-GTM-0
R25 10k
R26 820
R10
R11
R12 33k
R17 15k
+10V
-12V
R5 2.2k
+12V
Q1 2SC1815Y
R3 22k
R4 1k
CR1 05AZ5.1X
P614 J614
P613 J613
TP4
TP5
C28 1000P
C14 10/16
C15 1000p
R16 3.3k
R15
CR3 1S158
R22
STC
TRIG
GND
BW
GAIN
9
10
4
8
7
6
5

Fig.2

NOTE: ADD 700 TO PARTS NUMBER.

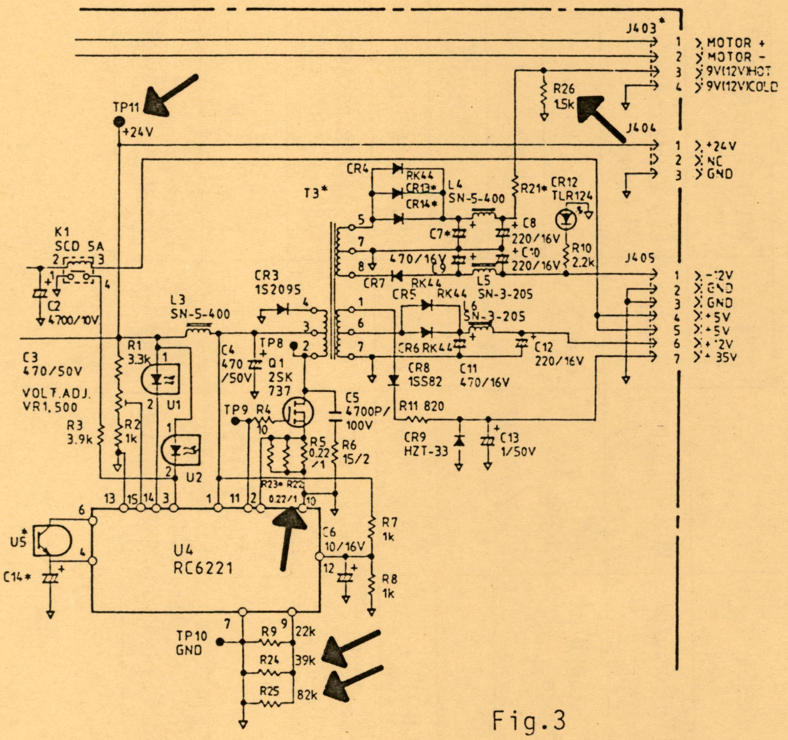

J403*
MOTOR +
MOTOR -
9V(12V)HOT
9V(12V)COLD
R26 1.5k
J404
+24V
NC
GND
TP11
+24V
CR4
RK44
CR13*
CR14*
L4 SN-5-400
R21*
CR12 TLR124
T3*
C7*
C8 220/16V
C10 220/16V
R10 2.2k
470/16V
C9
CR7 RK44
L5 SN-3-205
J405
-12V
GND
GND
+5V
+5V
+12V
+35V
K1 SCD 5A
C2 4700/10V
CR3 1S2095
CR5 RK44
L6 SN-3-205
L3 SN-5-400
C3 470/50V
VOLT.ADJ. VR1,500
R1 3.3k
U1
C4 470/50V
TP8
Q1 2SK737
CR6 RK44
C12 220/16V
CR8 1SS82
C11 470/16V
R3 3.9k
R2 1k
U2
TP9 R4
R5 0.22/1
R6 15/2
C5 4700P/100V
R11 820
CR9 HZT-33
C13 1/50V
R23* R22* 0.22/1
C6 10/16V
R7 1k
R8 1k
U5*
C14*
U4 RC6221
TP10 GND
R9 22k
R24 39k
R25 82k

Fig.3

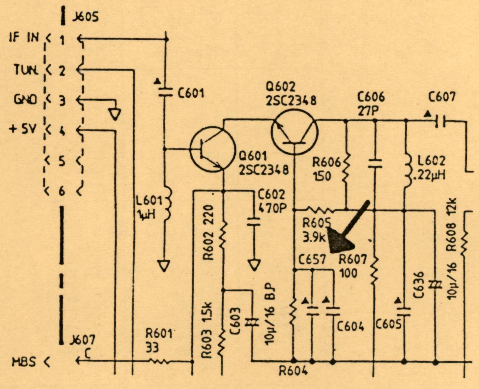

J605
IF IN
TUN.
GND
+5V
C601
Q602 2SC2348
C606 27P
C607
Q601 2SC2348
R606 150
L602 .22μH
L601 1μH
R602 220
C602 470P
R605 3.9k
R607 100
R608 12k
C657
C636
10μ/16
R603 15k
C603
10μ/16 B.P
C604
C605
J607
MBS
R601 33
R604

Fig.4

LAYOUT OF THIS SERVICE MANUAL

This service manual is made up of three parts;

PART 1 for DISPLAY UNIT,
PART 2 for SCANNER UNIT,
PART 3 for common items to both units such as MAINTENANCE, REPLACEMENT, and TROUBLESHOOTING.

ELECTRICAL PARTS LIST, MECHANICAL PARTS LIST, SCHEMATIC DIAGRAM, MECHANICAL PARTS EXPLODED VIEW and INTERCONNECTION DIAGRAM are attached at the end of this manual.

PART 1 involves the block description, adjustment, and parts location only with respect to the display unit. PART 2 also involves the same items as above only with respect to the scanner unit. PART 3 supplies the maintenance & replacement of major components, and troubleshooting for this radar system regarding to both display and scanner units.

This style of compilation will enable readers to consult quickly the items specific to the concerned unit.

GENERAL CONTENTS

SPECIFICATIONS

INTRODUCTION

PART 1 ---------------------------- DISPLAY UNIT

PART 2 ---------------------------- SCANNER UNIT

PART 3 ---------------------------- MAINTENANCE & REPLACEMENT OF MAJOR COMPONENTS, and TROUBLESHOOTING

ELECTRICAL PARTS LIST P-1 to P-11

MECHANICAL PARTS LIST P-12 to P-16

SCHEMATIC DIAGRAM S-1 to S-11

MECHANICAL PARTS EXPLODED VIEW D-1 to D-5

SPECIFICATIONS OF FR-1500 SERIES RADAR

1. SCANNER UNIT

1. Radiator Length: 2. Radiator Type:	123cm XN-2	200cm XN-3	200cm XN-3A	240cm** XN-4A
3. Horizontal Beamwidth:	1.80°	1.23°	1.23°	0.95°
4. Vertical Beamwidth:	25°	25°	20°	20°
5. Sidelobe Attenuation: within ± 10° of mainlobe (± 20° for 123cm antenna)	-24dB	-24dB	-28dB	-28dB
outside ± 10° of mainlobe (± 20° for 123cm antenna)	-30dB	-30dB	-32dB	-32dB

** Power supply must be 24VDC for 240cm antenna, and selectable for FR-1510/1525.

6. Polarization:	Horizontal
7. Antenna Rotation:	24 rpm nominal (no wind load)
8. Wind Load:	Relative wind 51.5 m/s (100kts)

2. TRANSCEIVER UNIT

1. Transmitting Tube:	Magnetron
2. Frequency and Modulation:	9410 ± 30MHz, PON (X-band)
3. Peak Output Power:	5kW (FR-1505), 10kW (FR-1510) and 25kW (FR-1525)

4. Pulselength & Pulse Repetition Rate:

<table>
<tr><th rowspan="2">Pulselength</th><th rowspan="2">Pulse Rep. Rate (Hz)</th><th colspan="10">Range (nm)</th></tr>
<tr><th>0.25</th><th>0.5</th><th>0.75</th><th>1.5</th><th>3</th><th>6</th><th>12</th><th>24</th><th>48</th><th>96*</th></tr>
<tr><td>Short (SP) 0.08us</td><td>approx. 2100Hz</td><td colspan="4">0.08us</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Middle 1 (M1P) 0.3us</td><td>"</td><td></td><td></td><td></td><td colspan="2">0.3us</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Middle 2 (M2P) 0.6us</td><td>approx. 1200Hz</td><td></td><td></td><td></td><td></td><td colspan="4">0.6us</td><td></td><td></td></tr>
<tr><td>Long (LP) 1.2us</td><td>approx. 600Hz</td><td></td><td></td><td></td><td></td><td></td><td colspan="5">1.2us</td></tr>
</table>

* for FR-1510/1525 only

5. Modulator:	SCR line Type Pulse Modulator	
6. IF:	60MHz	
7. Tuning:	Manual, with tuning marker	
8. Receiver Front End:	MIC (Microwave IC)	
9. Bandwidth:	D-type	DA-type
Short Pulse	13MHz	7MHz
Med./Long Pulse	3MHz	3MHz
10. Duplexer:	Circulator and Limiter	

3. DISPLAY UNIT

1. Indication System:	PPI, daylight display									
2. Picture Tube:	15" rectangular CRT									
3. Range (nm):	0.25	0.5	0.75	1.5	3	6	12	24	48	96
4. Range Ring Interval (nm):	0.05	0.1	0.25	0.25	0.5	1	2	4	8	16
5. Number of Rings:	5	5	3	6	6	6	6	6	6	6

FR-1510/1525 only

6. Display Mode:	1) Head-up 2) Course-up* 3) North-up* 4) Head Set** * gyrocompass required ** when no gyro is connected
7. Bearing Resolution:	better than 2.4°; radiator XN-2 1.83°; radiator XN-3 1.83°; radiator XN-3A 1.55°; radiator XN-4A
8. Bearing Accuracy:	better than 1.0°
9. Range Discrimination:	better than 34m
10. VRM/Range Ring Accuracy:	1% or 10m, whichever is greater
11. Marks:	Heading Mark, North Mark, Bearing Scale, Range Ring, VRM1 & VRM2, EBL1 and EBL2, Tuning Marker, Guard Zone.
12. Numeral/Character Indication:	Range in Use, Range Ring Interval, Display Mode (Head-up, North-up, Course-up, Head Set), Pulselength (SP, M1P, M2P, LP), Interference Rejector (IR), Alarm (GUARD), Gyro, Echo Stretch (ESR), Performance Monitor (PM), EBL, EBL Bearing Mode (TRU, REL), VRM, Echo Average (EAV1, EAV2, EAV3), Zoom (X2 ZOOM), Plotting (ECHO TRAIL), Fast Time Constant (FTC).
13. Plotting Mode:	Continuous (max. 99min 59sec), 30sec, 1min, 3min or 6min
14. Interference Rejector:	Built in
15. Off-center Display:	Built in
16. Zoom Function:	Picture is doubled in scale with center at arbitrary location.

4. ENVIRONMENTAL CONDITIONS

1. Vibration:

Total Amplitude	Vibration Cycle
± 1.6mm	1 to 12.5Hz
± 0.38mm	12.5 to 25Hz
± 0.10mm	25 to 50Hz

2. Ambient Temperature:

Scanner Unit ------	-25°C to +70°C
Display Unit ------	-15°C to +55°C

3. Humidity: Relative Humidity 95% at +40°C

5. POWER REQUIREMENTS

FR-1505D/DA

12/24/32VDC, 100W (24VDC)
100/110/115/220/240VAC, 170VA (100VAC), 50-60Hz, 1ø (rectifier required)

FR-1510D/DA

12/24/32VDC, 110W (24VDC), 32VDC mains cannot be used for 240cm antenna.
100/110/115/220/240VAC, 180VA (100VAC), 50-60Hz, 1ø (rectifier required)

FR-1525D/DA

24/32VDC, 140W (24VDC), 32VDC mains cannot be used for 240cm antenna.
100/110/115/220/240VAC, 230VA (100VAC), 50-60Hz, 1ø (rectifier required)

6. COLOR

Scanner Unit:	Munsell N9.5
Display Unit:	2.5GY/1/5 Embossed T25 (Cabinet) N3.0 Newtone No.5 (Control Panel)

INTRODUCTION

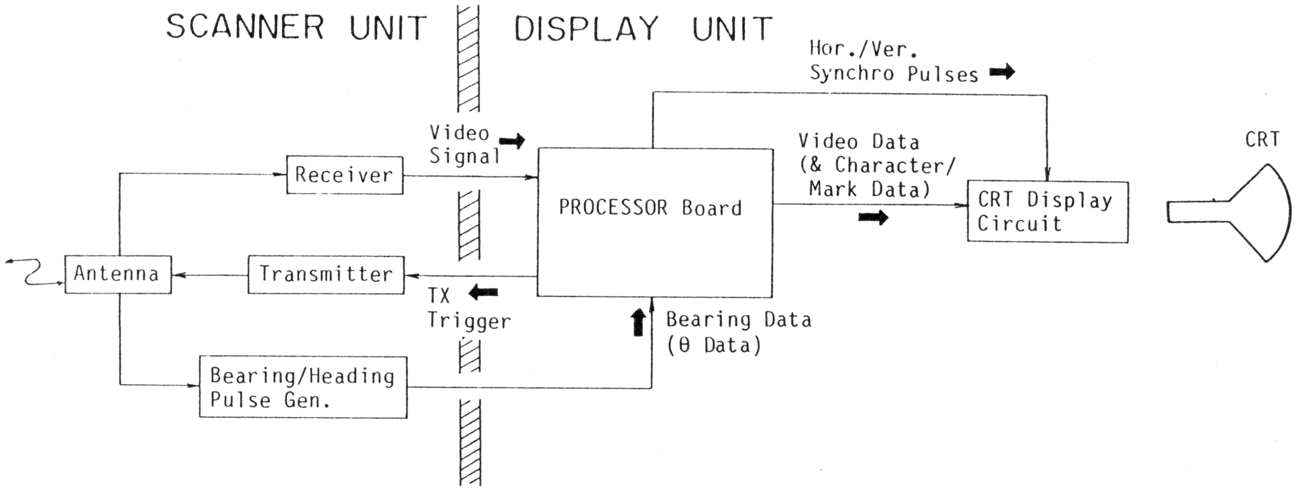
The FR-1500 series are stand-alone daylight radars. The series comprises six models; FR-1505D, FR-1505DA, FR-1510D, FR-1510DA, FR-1525D and FR-1525DA. The system consists of the display and scanner units and operates directly from 12(only for FR-1505/1510)/24/32VDC ship's mains. For operation from 100/110/115/220/240VAC, an additional rectifier unit is required.

The simplified block diagram is shown below. When the STBY/TX touchpad on the front panel is depressed approximately 3 minutes after turning on the radar, the TX trigger pulses are generated at the PROCESSOR board (03P6977) to fire the Transmitter in the scanner unit, and 9410MHz microwave pulses are generated and emitted from the antenna.

The reflected echo signal from the target is received by the same antenna and amplified at the Receiver. Then the amplified signal (video signal) is A-D converted and stored in the memory of the PROCESSOR board. The X-Y coordinate address is generated by using both the range data (time elapsed from transmission) and the bearing data (θ data generated at the BEARING SIGNAL GEN. board in the scanner unit).

Read-out of the video data in the memory is performed by the hor./ver. address counters at the PROCESSOR board and sent to the CRT Display circuit in a manner similar to an ordinary TV display system, that is, the video data is successively converted into analog signal and sent to the CRT Display circuit in synchronism with the horizontal/vertical synchro pulses derived from the PROCESSOR board and displayed on the screen.

The Characters, Heading Mark, North Mark, Fixed Range Rings, EBL and VRM data are produced in the PROCESSOR board and displayed on the screen thru the CRT Display circuit in the same manner as the video data.


SCANNER UNIT
DISPLAY UNIT
Hor./Ver. Synchro Pulses
Video Signal
Video Data (& Character/ Mark Data)
CRT
Receiver
PROCESSOR Board
CRT Display Circuit
Antenna
Transmitter
TX Trigger
Bearing Data (θ Data)
Bearing/Heading Pulse Gen.

PART 1

DISPLAY UNIT

CONTENTS

* * * * * *

	Page
GENERAL INFORMATION	0-1
CHAPTER 1. BLOCK DESCRIPTION	1-1 to 1-19
1-1. Power Supply	1-1
1-2. Signal Processor	1-4
1-3. CRT Display	1-18
CHAPTER 2. ADJUSTMENT	2-1 to 2-3
CHAPTER 3. PARTS LOCATION	3-1 to 3-3

GENERAL INFORMATION

The display unit contains the following p.c.boards. Most of them, except for the POWER SUPPLY, FILTER and TX HV boards, are changeable among models.

Table 0-1 P.C.Board Convertibility

Block No.	P. C. Board			Model FR-					
	Name	Type	Code No.	1505D	1505DA	1510D	1510DA	1525D	1525DA
1B2	POWER SUPPLY	APTU-6982 25kW,24V, XN4A	008-103-950					(o)	(o)
		BPTU-6982 10kW,24V, XN4A	008-103-960			(o)	(o)		
		BPTU-6982 10kW, 24/32V,other than XN4A	008-103-970			(o)	(o)		
		BPTU-6982 10kW,12V, other than XN4A	008-103-980			(o)	(o)		
		APTU-6982 5/25kW, 24/32V, other than XN4A	008-103-990	(o)	(o)			(o)	(o)
		APTU-6982 5kW, 12V	008-104-000	(o)	(o)				
1B3	FILTER	FIL-6983 12Vdc	008-103-640	(o)	(o)	(o)	(o)	(o)	(o)
		FIL-6983 24/32Vdc	008-103-650	(o)	(o)	(o)	(o)	(o)	(o)
1B4	TX HV	AHV-7130	008-104-940					o	o
		BHV-7130	008-103-600	o	o	o	o		
1B5	PROCESSOR	03P6977	008-102-860	o	o	o	o	o	o
1B6	INTERFACE	03P6980	008-103-610	o	o	o	o	o	o
1B7	PANEL	03P6978	008-105-610	o	o	o	o	o	o
1B8	FLAT KEYBOARD	03P6984	000-111-152	o	o	o	o	o	o
1B9	ILLUMINATION	03P6979	008-103-620	o	o	o	o	o	o
1B10	EBL	03P6981	008-103-630	o	o	o	o	o	o
1B11	VRM	03P6981	008-103-630	o	o	o	o	o	o
1B12	CRT ASSEMBLY	TR-1523X9A	000-110-817	o	o	o	o	o	o

CHAPTER 1. BLOCK DESCRIPTION

1-1. Power Supply

The power supply circuit consists of a PWM (Pulse Width Modulation) inverter, rectifier, power failure detector and +10V regulator and protector as shown below.

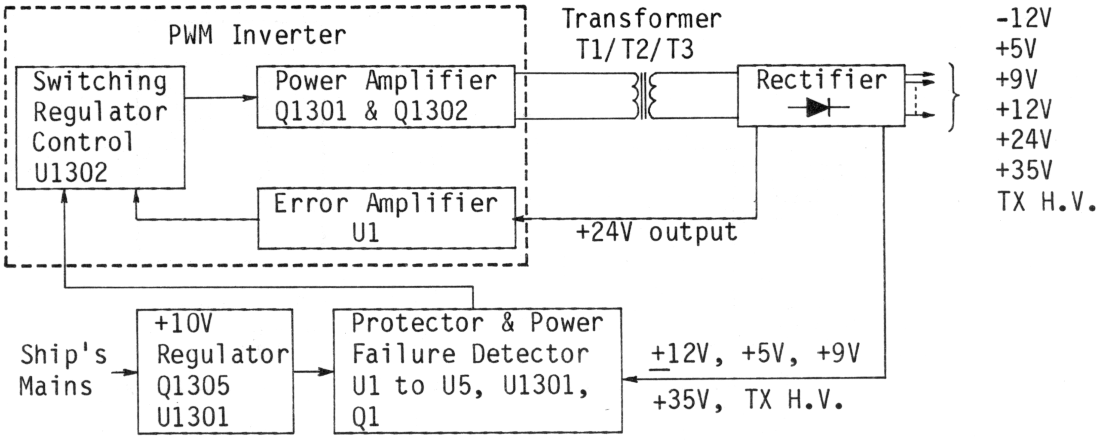

PWM Inverter
Switching Regulator Control U1302
Power Amplifier Q1301 & Q1302
Error Amplifier U1
Transformer T1/T2/T3
Rectifier
-12V
+5V
+9V
+12V
+24V
+35V
TX H.V.
+24V output
Ship's Mains
+10V Regulator Q1305 U1301
Protector & Power Failure Detector U1 to U5, U1301, Q1
±12V, +5V, +9V
+35V, TX H.V.

Fig.1-1 Block Diagram of Power Supply Circuit

PWM Inverter

The PWM inverter is composed of a switching regulator control, power amplifier and error amplifier. The function of the PWM inverter is as follows. When +24V output voltage increases at the secondary winding of T2, the amount of current flowing into photo coupler U1 increases and the voltage at pin #2 of U1302 goes higher than 2.5V, causing the slice level for the reference oscillator output (sawtooth waveform) to move upward as shown in Fig.1-2. As a result, the output pulsewidth of comparator(2) becomes narrower. A narrower pulsewidth will cause the dc output voltage to decrease. To the contrary, when +24V line voltage decreases, the slice level goes down and the output pulsewidth comes wider to increase the dc output voltage.

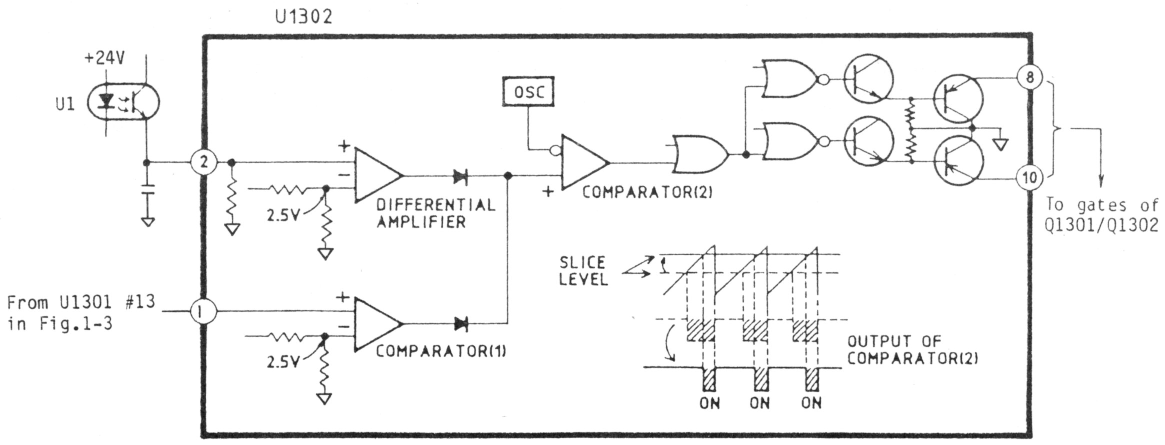

U1302
+24V
U1
2
2.5V
DIFFERENTIAL AMPLIFIER
OSC
COMPARATOR(2)
8
10
To gates of Q1301/Q1302
SLICE LEVEL
From U1301 #13 in Fig.1-3
1
2.5V
COMPARATOR(1)
OUTPUT OF COMPARATOR(2)
ON
ON
ON

Fig.1-2

Protector

The protector circuit operates to disable inverter oscillation when either of the following conditions occurs.

(1) When overcurrent flows into the scanner motor.
(2) When overcurrent flows into one of the dc lines (-12V, +5V, +9V, +12V, +35V and TX H.V.).

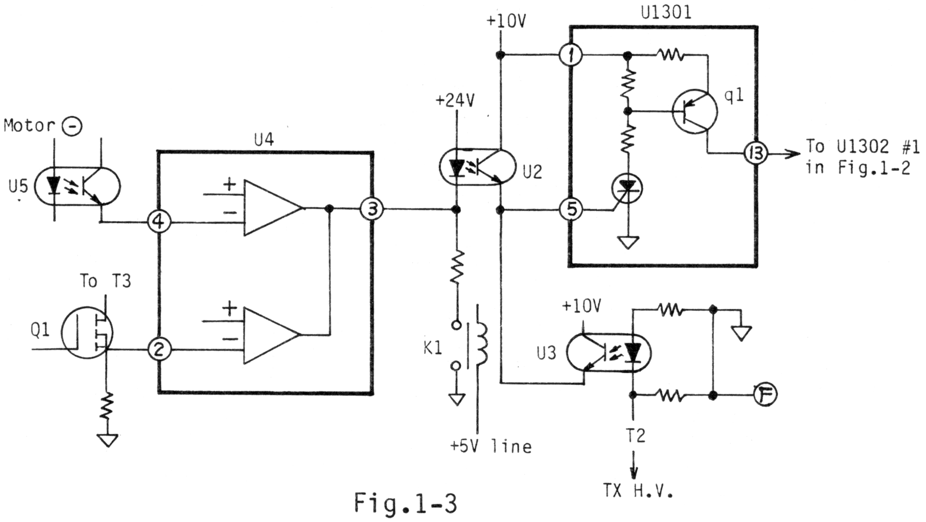


Fig.1-3

See Fig.1-3. If overcurrent flows into the scanner motor, photo coupler U5 turns on and the voltage at pin #3 of U4 goes low, causing photo coupler U2 to become conductive. When U2 turns on, current flows into pin #5 of U1301 and q1 inside of U1301 turns on. This makes the voltage at pin #13 of U1301 high. Then, the voltage at pin #1 of U1302 (Fig.1-2) goes higher than 2.5V, and the output of comparator(1) goes positive. Since the positive voltage is higher than the amplitude of the sawtooth waveform from the reference oscillator, the output of comparator(2) is held "H" at all times. Consequently the voltages at pins #8 and #10 of U1302 are kept low, causing the inverter to stop oscillating.

When overcurrent flows into one of ±12V, +9V and +35V lines connected to the secondary winding of T3, excessive current flows into FET Q1, which is connected to the primary winding of T3. Therefore, the drain current of Q1 increases and the voltage at pin #3 of U4 goes low, causing the inverter to stop oscillating in the same manner as mentioned above.

When +5V line connected to the secondary winding of T1 is overloaded, relay K1 turns on and U2 becomes conductive. As the result, the inverter stops oscillating in the same manner as mentioned above.

When the TX H.V. line connected to the secondary winding of T2 is grounded, the LED of photo coupler U3 turns on and the corresponding photo transistor turns on. Since its emitter is connected to pin #5 of U1301, the inverter stops oscillating in the same manner as mentioned above.

Power Failure Detector

If the ship's mains suddenly drops to zero, +24V output line also drops, which increases the voltage at pin #3 of U1301 and decreases the output voltage of comparator(1) inside U1301. Then, q1 inside U1301 turns off and U113 at PROCESSOR p.c.board turns off. The collector potential of photo transistor U113, therefore, goes up and interruption to the CPU is performed. Potentiometer VR1 is provided to adjust threshold level.

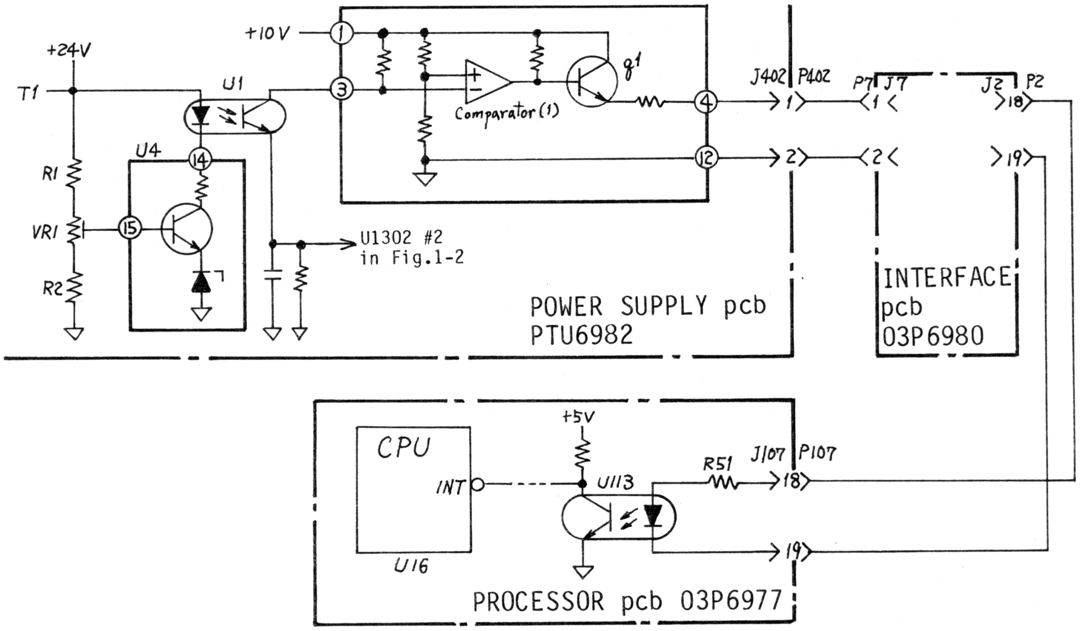

+24V
T1
R1
VR1
R2
U1
U4
+10V
Comparator (1)
q1
U1302 #2
in Fig.1-2
J402
P402
P7
J7
J2
P2
POWER SUPPLY pcb
PTU6982
INTERFACE pcb
03P6980
+5V
CPU
INT
U16
U113
R51
J107
P107
PROCESSOR pcb 03P6977

Fig.1-4

+10V Regulator

Regulated +10V is derived at the collector of Q1305 and applied to switching regulator control U1302 #11. Fig.1-5 shows the series regulator circuit.

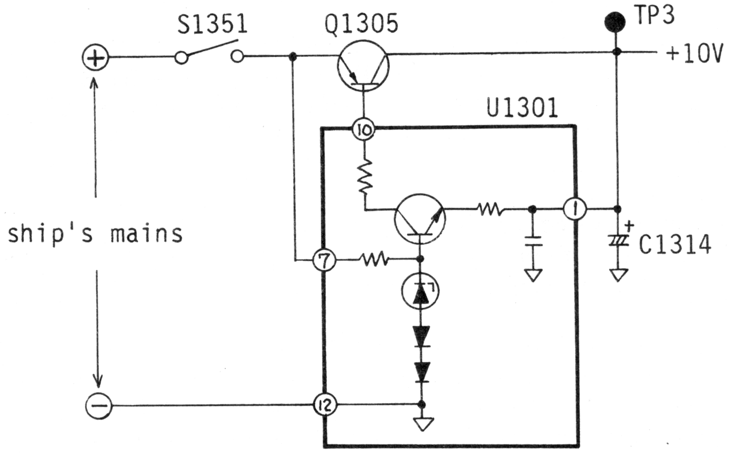

S1351
Q1305
TP3
+10V
U1301
ship's mains
C1314

Fig.1-5

1-2. Signal Processor

General

The PROCESSOR board 03P6977 is the heart of the display unit, and contains various circuits. Each circuit is separately explained in detail.

The simplified block diagram of the PROCESSOR board is shown on next page.

The analogue IF output signal (video signal) coming from the scanner unit is applied to the A/C rain (FTC) circuit to reduce the rain clutter and to the echo stretch circuit to magnify the signal lengthwise for better distinction on operator's demand. Then, the video signal is converted into 8-bit data (gradations). These data are led to the gate arrays "A" and "B" at the same time and encoded into 3-bit data depending on its gradation. Each data for one sweep is temporarily stored into S-RAM. The 3-bit data read-out from S-RAM's are led to the EAV (echo average) circuit that the stable echoes, e.g., ships or land, are extracted from the unstable echo, e.g., sea clutter. After above signal processing, the data for one scan are stored into the video RAM for echo. There are three kinds of video RAM's, i.e., for echo, plot and mark/character. Output from these RAM's are mixed and applied to the INTERFACE board, where the digital data is converted into analogue signal to display on the CRT. On the other hand, Z-80 CPU and associated circuit is provided to control most of the circuit.

FTC, Echo Stretch, A/D Conv.

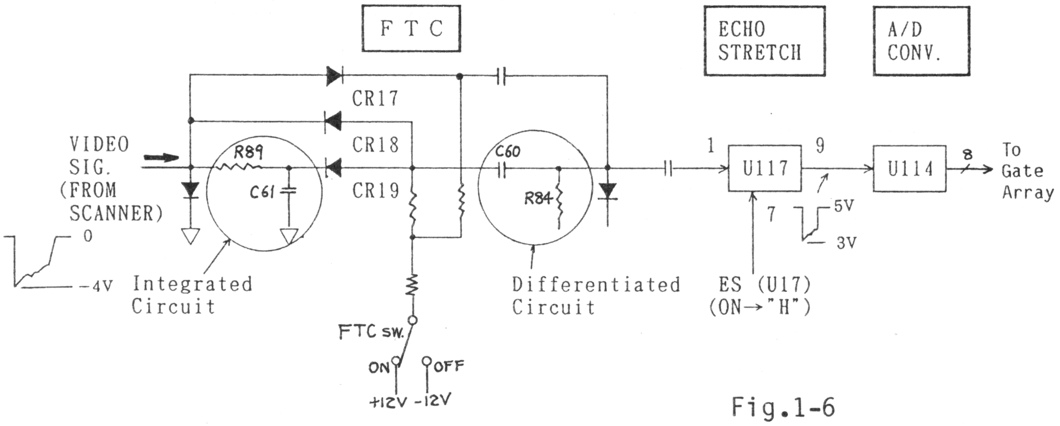
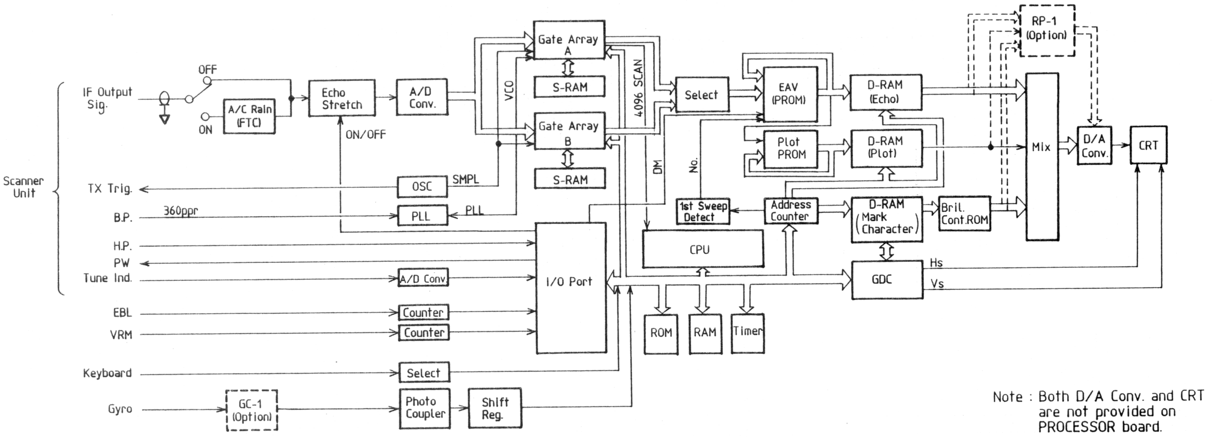


Fig.1-6

The video signal derived from the scanner unit is first sent to the FTC circuit composed of R89/R84, C61/C60, CR17/CR18/CR19, etc to suppress the clutter components such as rain or snow clutter. See Fig.1-6. When the FTC switch is pulled out, +12V is applied to the FTC circuit and the video signal passes through CR18 and CR19. The signal is integrated by R89/C61 to reduce noise and differentiated by C60/R84 to activate FTC effect. To the contrary, -12V is applied to allow the signal to bypass the FTC circuit, i.e., pass through CR17, when pushing-in the switch. Then, the signal is magnified lengthwise about twice at U117 on 3 n.m. range or over when the ECHO STRETCH touchpad is depressed and A/D converted into 8-bit data (gradations) by U114.


Gate Array A
S-RAM
Gate Array B
S-RAM
VCO
4096 SCAN
IF Output Sig.
OFF
ON
A/C Rain (FTC)
Echo Stretch
A/D Conv.
ON/OFF
Scanner Unit
TX Trig.
B.P.
360ppr
H.P.
PW
Tune Ind.
EBL
VRM
Keyboard
Gyro
GC-1 (Option)
OSC
SMPL
PLL
PLL
A/D Conv
Counter
Counter
Select
Photo Coupler
Shift Reg.
I/O Port
DM
No.
Select
EAV (PROM)
Plot PROM
D-RAM (Echo)
D-RAM (Plot)
1st Sweep Detect
Address Counter
D-RAM (Mark Character)
CPU
ROM
RAM
Timer
GDC
Hs
Vs
Bril. Cont.ROM
RP-1 (Option)
Mix
D/A Conv.
CRT

Note : Both D/A Conv. and CRT are not provided on PROCESSOR board.

Fig.1-7 Simplified Block Diagram of PROCESSOR Board

Video Input Buffer Memory

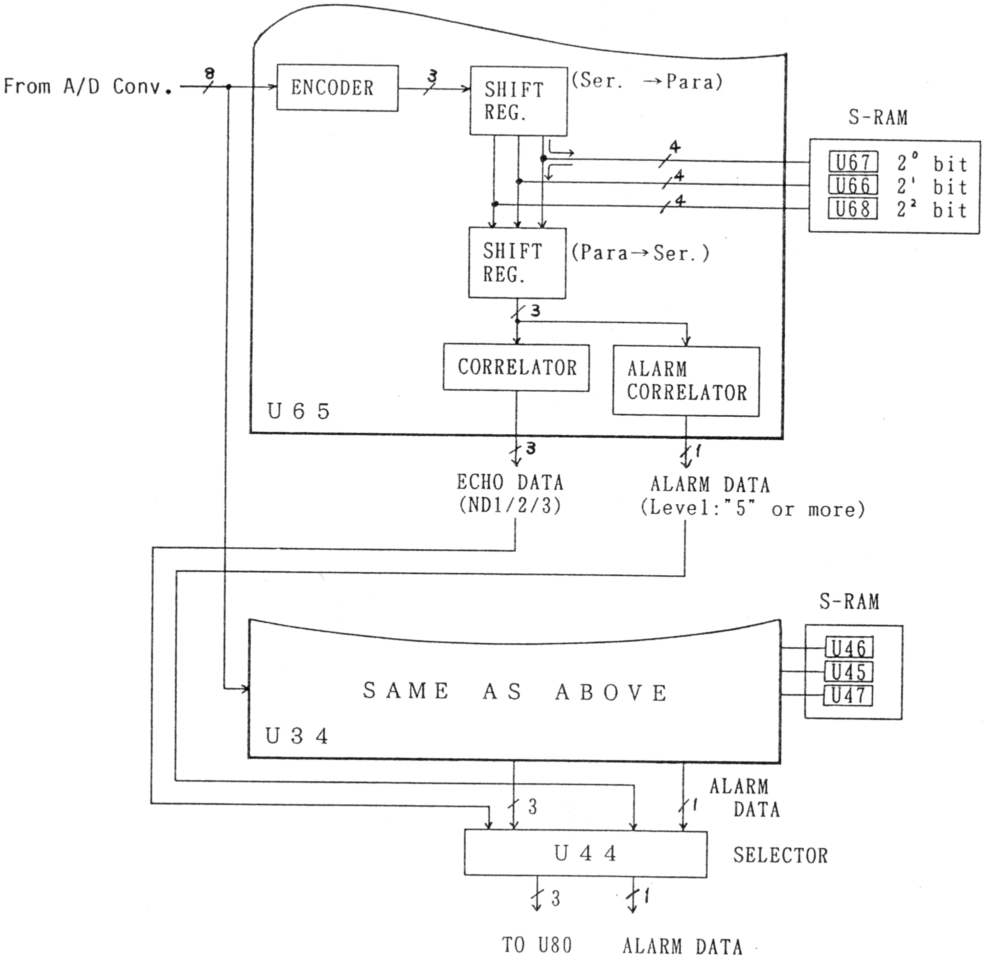

From A/D Conv.
8
ENCODER
3
SHIFT REG.
(Ser. →Para)
S-RAM
4
4
4
U67 2° bit
U66 2' bit
U68 2² bit
SHIFT REG.
(Para→Ser.)
3
CORRELATOR
ALARM CORRELATOR
U 6 5
3
1
ECHO DATA (ND1/2/3)
ALARM DATA (Level:"5" or more)
S-RAM
U46
U45
U47
SAME AS ABOVE
U 3 4
3
1
ALARM DATA
U 4 4
SELECTOR
3
1
TO U80
ALARM DATA

Fig.1-8

The A/D converted 8-bit data is led to the gate arrays U65 and U34, which have various functions. Some of them are shown in Fig.1-8. Each bit of the encoded 3-bit data is pushed into a 4-bit shift register, and the shift register content is parallel-transferred into a static RAM whenever the shift register becomes full. Three S-RAM's (1 word = 4 bits) store D_0 (LSB, 2^0), D_1 (2^1) and D_2 (MSB, 2^2) bits respectively. The purpose of the buffer memory is to improve picture quality on middle 2 and long ranges. Since the pulse repetition rate on both ranges is lower than that on short and middle 1 ranges, there exists a gap between two neighboring transmissions. Interpolation, therefore, is effective to fill the gap by repeatedly reading out the same data stored in the buffer memory until the next transmission starts. The data read-out from S-RAM's are seriallized into the original 3-bit data string and applied to two correlators to eliminate unwanted signal, noise, interference, etc.; one for 3-bit new echo data (ND1/2/3) and the other for 1-bit alarm data.

Write and read timing of S-RAM's for each gate array is shown in Fig.1-9, i.e., S-RAM's U67/66/68 and U46/45/47 are alternately accessed at every sweep.

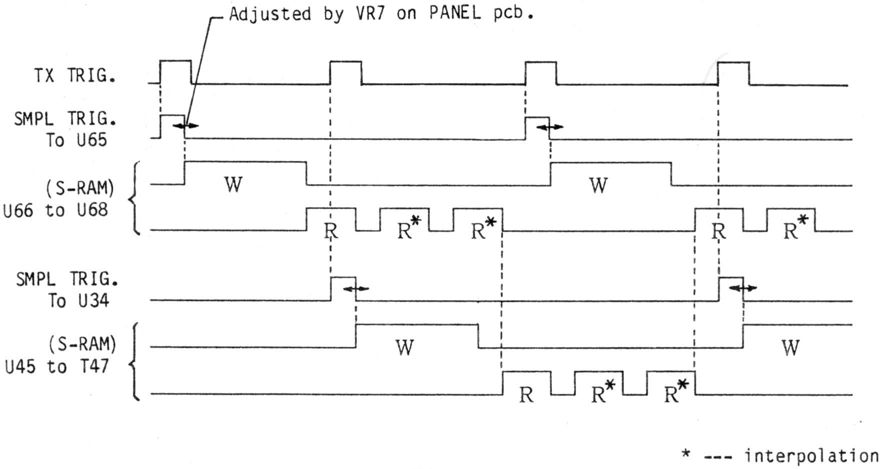

Adjusted by VR7 on PANEL pcb.
TX TRIG.
SMPL TRIG.
To U65
(S-RAM)
U66 to U68
W
R
R*
R*
W
R
R*
SMPL TRIG.
To U34
(S-RAM)
U45 to T47
W
W
R
R*
R*
* --- interpolation

Fig.1-9

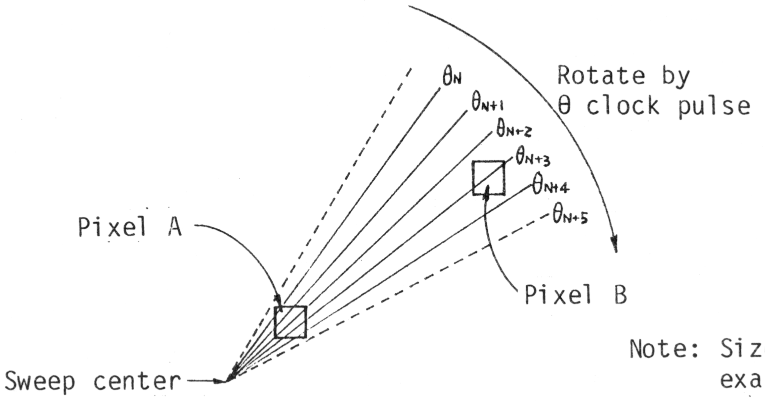
EAV (Echo Averaging)

The purpose of echo averaging is to correlate (compensate) the echo presented at near the own ship.

The sweep line is rotated clockwise by θ (360°/4096) clock pulses, and hits each pixel. The number of the sweep line hit each pixel differs, depending on the X-Y address of the pixel, i.e., a pixel located near the sweep center is hit by more sweep lines than that located far from the center of the screen as illustrated below.

Pixel B is hit by sweep line θ_{N+3} and drawn by the data contained on sweep line θ_{N+3}. To the contrary, pixel A is hit by five sweep lines θ_N thru θ_{N+4}, and drawn by the data contained on sweep line θ_{N+4} only since sweep line θ_{N+4} is the latest sweep at pixel A. The data contained on sweep line θ_N thru θ_{N+3} are ignored.

Echo averaging technique has been introduced to effectively use all the pixel data offered by several sweep lines which hit a pixel.


θ_N
θ_{N+1}
θ_{N+2}
θ_{N+3}
θ_{N+4}
θ_{N+5}
Rotate by
θ clock pulse
Pixel A
Pixel B
Sweep center

Note: Size of pixel is exaggarated for explanation.

Fig.1-10

The "new" echo data ND1 to ND3 are applied to the address input of P-ROM U80, and the following things occur in order.

(1) When "new" echo data are delivered from the S-RAM, 3-bit data stored at the relevant X-Y address of the video RAM read out. The data are temporarily latched into U90, and applied to the other address input of U80 as the "old" echo data.

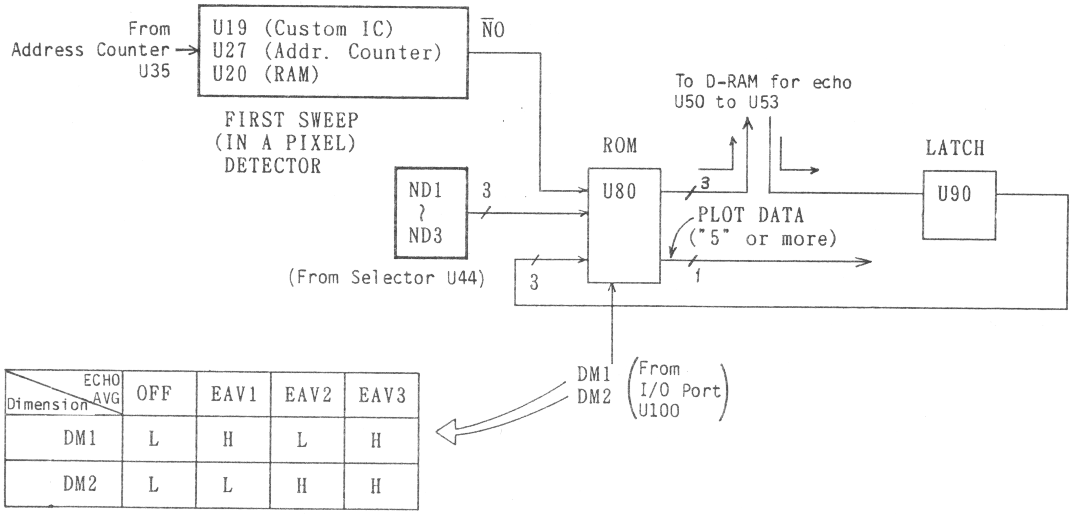
(2) Being addressed by both the new data and old data (latch content), ROM U80 outputs 4-bit data. U80 is a kind of correlator. The output data are similar to the new data, but modified a little bit by the old data. U80 contains such data for all the possible combinations of new and old data.

(3) The correlated data (ROM output) are stored into the same X-Y address of the video RAM from which the old data was read in step (2), i.e., the video RAM content is updated.

When the above-mentioned process (1) to (3) is applied to every new data after a transmission, the pixels (address locations) for one sweep line are updated, and after one scan (one rotation of the antenna) completion, the pixels for one complete plane are updated.

Note 1. ROM is divided into four areas, and each area contains a different correlation data. The ECHO AVG status (OFF, EAV1, EAV2, EAV3) is coded into 2-bit data (DM1, DM2) and applied to the address input of U80 for selection of the designated area.

2. When the sweep line hits a pixel for the first time, the new data are corralated with the pixel data which were written one scan before. When the sweep line hits the pixel for the second time and later, the new data are correlated with the pixel data which were written one sweep before. The first hitting and the second (and later) hittings are identified by U19, U27 and U20 for each pixel, and different areas (different correlation data) of the ROM are used between the two cases.


From Address Counter U35
U19 (Custom IC)
U27 (Addr. Counter)
U20 (RAM)
$\overline{NO}$
FIRST SWEEP (IN A PIXEL) DETECTOR
ND1 ~ ND3
3
(From Selector U44)
3
ROM
U80
To D-RAM for echo U50 to U53
3
PLOT DATA ("5" or more)
1
LATCH
U90
DM1
DM2
(From I/O Port U100)

Dimension \ ECHO AVG	OFF	EAV1	EAV2	EAV3
DM1	L	H	L	H
DM2	L	L	H	H

Fig.1-11 EAV Function

Video RAM Control

Refer to Fig.1-13 on page 1-11.

There are three memory blocks; for echo (U50 to U53), plot (U54 to U57) and marks/characters (U76 to U79) data. Each video RAM has a capacity of 256K x 4 bits to cover the entire screen (512 dots x 512 dots), taking the off-center function into account. The dynamic RAM's used for echo and plot are so called "Dual Port RAM", which has a serial output port in addition to the conventional parallel I/O port. By using this type of RAM, the memory circuit comes to be simple. On the other hand, the D-RAM used for marks/characters is the conventional one. The shift resisters, therefore, are required in order to change the parallel output data to serial one.

The 3-bit echo data and 1-bit alarm area data are applied to the parallel I/O port of U50 through U53 and stored into each address assigned by the memory address controller U35. Polar coordinates (r, θ) to X-Y coordinates conversion is done at U35, i.e., X = r x sinθ and Y = r x cosθ.

The 4-bit plot data coming from P-ROM U89 are stored into U54 through U57. See the block diagram below.

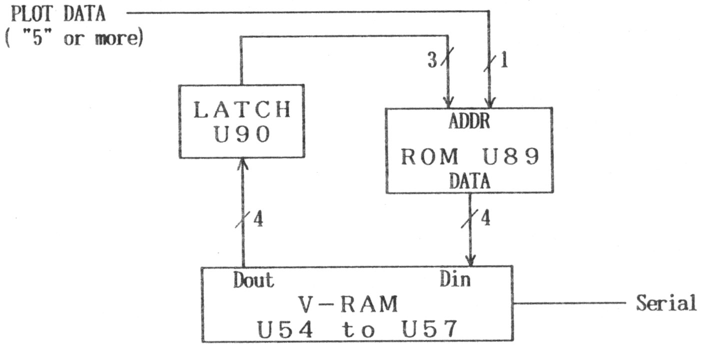


Fig.1-12 Plotting Function

When the sweep line hits a pixel for the first time, the following things occur in order.

(1) If the level of the new data (ND1 - ND3) is 5 or more, logical ONE is applied to the address input of the ROM as "new" plot data (NPD hereafter). If the level is below 5, NPD is ZERO.

(2) The pixel at the relevant X-Y address in the video RAM for plotting is read out and latched into U90. The pixel is 4-bit, but the MSB is not used (not latched).

(3) Being addressed by both the NPD (1 bit) and the latch content (3 bits, "old" plot data), ROM U89 outputs 4-bit data. U89 is a kind of calculator, and outputs an answer as DATA output, depending on the input (ADDRESS) data. The "answer" for every possible ADDR input is preprogrammed in the ROM.

(4) The 4-bit output (answer) from the ROM is stored at the same X-Y address in the video RAM, i.e., the pixel is updated.

The ROM outputs such 4-bit data as below;

- The lower 3 bits are calculation results, and they circulate;

  → RAM → LATCH → ROM →

  If NPD is logical ONE (the pixel is covered by a target), the ROM sets all the 3 bits (HHH). If NPD is logical ZERO (the pixel is not covered by a target), the ROM decreases the 3-bit value by ONE. The 3-bit value, therefore, returns to zero if NPD keeps zero for the consecutive 7 times of calculations.

- The MSB of the 4-bit data is determined by the above-mentioned 3-bit value, and is cleared if the 3-bit value is zero, and is set if the 3 bits are non-zero value. If this bit is set, the pixel is illuminated for plotting.

Thanks to the above-mentioned arrangement, a pixel is kept lighting for a while (for 7-time down counting) after the target has gone from the pixel position.

The following marks/characters data sent from GDC (Graphic Display Controller) U36 are applied to U76 through U79 respectively.

U76 --- circle frame on the CRT
U77 --- characters
U78 --- range rings, EBL, VRM
U79 --- heading mark

The GDC has the following functions.

(1) Produces the read address data (horizontal/vertical) for the video RAM.
(2) Produces the marks/characters data.
(3) Generates the horizontal and vertital synchro pulses for the CRT.

Output data from each D-RAM are latched by U102, U91 and U82 at the same dot clock timing, and mixed by P-ROM U101. The 3-bit mixed data are led to INTERFACE boadrd 03P6980 and converted into analogue data by D/A converter U1. After then, the data are derived to the CRT with the horizontal and vertical synchronization signals.

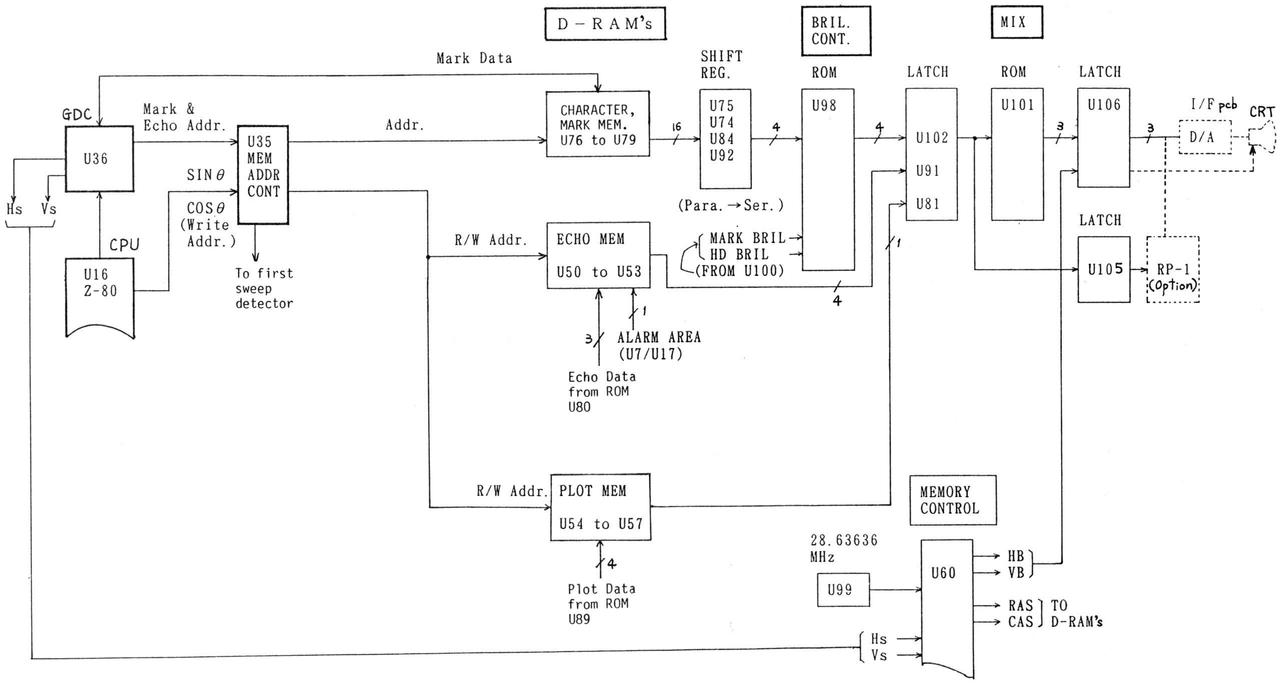

D－RAM's
BRIL. CONT.
MIX
Mark Data
SHIFT REG.
ROM
LATCH
ROM
LATCH
GDC
Mark & Echo Addr.
U36
U35 MEM ADDR CONT
Addr.
CHARACTER, MARK MEM. U76 to U79
16
U75 U74 U84 U92
4
U98
4
U102
U91
U81
U101
3
U106
3
I/F pcb
D/A
CRT
SIN θ
COS θ (Write Addr.)
Hs
Vs
CPU
U16 Z-80
To first sweep detector
(Para. → Ser.)
R/W Addr.
ECHO MEM U50 to U53
MARK BRIL
HD BRIL
(FROM U100)
4
1
LATCH
U105
RP-1 (Option)
3
1
ALARM AREA (U7/U17)
Echo Data from ROM U80
R/W Addr.
PLOT MEM U54 to U57
4
Plot Data from ROM U89
MEMORY CONTROL
28.63636 MHz
U99
U60
HB
VB
RAS
CAS
TO D-RAM's
Hs
Vs

Fig.1-13

BP (Bearing Pulse) & HP (Heading Pulse) Control

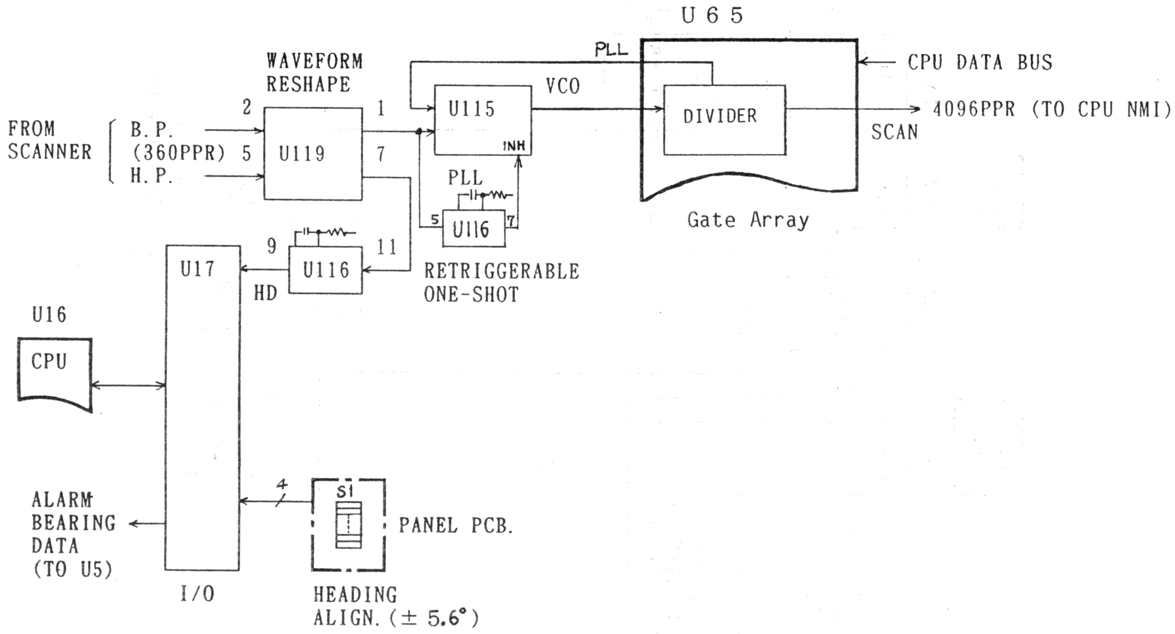

U 6 5
PLL
CPU DATA BUS
WAVEFORM
RESHAPE
VCO
2
1
U115
DIVIDER
4096PPR (TO CPU NMI)
SCAN
FROM
SCANNER
B.P.
(360PPR)
H.P.
5
U119
7
INH
PLL
5
U116
7
Gate Array
9
11
U17
U116
HD
RETRIGGERABLE
ONE-SHOT
U16
CPU
ALARM
BEARING
DATA
(TO U5)
4
S1
PANEL PCB.
I/O
HEADING
ALIGN. (± 5.6°)

Fig.1-14

Bearing pulse BP (360 pulses/rotation) comes from the BEARING SIG. GEN. board MP-3795 inside the scanner unit. The BP is reshaped by U119 and the one output from U119 is applied to PLL U115. Gate array U65 contains a frequency divider and outputs 4096 pulses per rotation. This signal is called "Scan", and is utilized to detect the antenna direction with high resolution. It means that the radar screen (360° full circle) is divided into 4096 equal sectors (every 0.088-degree). The scan signal is led to the NMI (Non Maskable Interrupt) terminal of CPU U16 and the CPU counts up the pulses in order to calculate sinθ/cosθ. The other output from U119 is led to the inhibit terminal of PLL U115 via U116 to stop PLL operation when no bearing pulses come in.

The heading pulse also comes from the BEARING SIG. GEN. board inside the scanner unit. The HP is reshaped by U119 and sent to the retriggerable one-shot multivibrator U116 in order to eliminate chattering which usually follows the heading pulse. Then, the heading signal is led to the CPU via PPI (Programmable Peripheral Interface) U17. By referring to this bit, the CPU can recognize the heading signal, and it clears the NMI count. (In reality, the count is not cleared. The CPU reads 4-bit HEADING ALIGN data through U17 and presets the count with the SCAN pulse number which corresponds to the DIP switch value.)

TX Trig. & Echo Sampling Trig.

Refer to Fig.1-16 on next page.

When the STBY/TX touchpad is depressed three minutes after turning on the POWER switch, the negative going pulses called "INTT (INTernal Trigger)" come out from the gate array U65. Its pulse repetition rate varies in accordance with the range data which are sent to U65 from the CPU. The internal trigger clears D-type flip-flop U82 and the potential at U82 $\overline{Q}$ turns to "H". This positive going pulse actuates retriggerable one-shot multivibrator U96 and a negative going pulse comes out at $\overline{Q}$ terminal. This pulse is inverted by OR gate U88 and turns on transistor Q5. As a result, a positive going TX trigger pulse shown below is obtained at the emitter of Q5, and delivered to the MOD. TRIGGER board of the scanner unit.

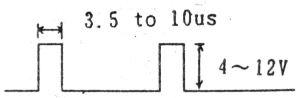


Fig.1-15

Note: The internal trigger slightly fluctuates, i.e., the pulse repetition rate changes slightly on every transmission, so as to avoid interference among radars operating in the field.

67.9875MHz oscillator U107 is used to get the sampling clock pulse called "SCK". 67.9875MHz is divided by 2 or 3 at counter U87 depending on the range setting, and applied to gate arrays U65 and U34 as a sampling clock pulse. This clock pulse is furthermore divided at the gate arrays in accordance with the range data coming from the CPU. On the other hand, the sampling start trigger pulse called "SMPL (SaMPLing)" is required in order to start the write operation (echo sampling). This pulse comes from D-type flip-flop U71 as shown in Fig.1-16. The clock pulse for U71 originates from the output Q of U82 and its timing is adjusted by potentiometer VR7 located on the PANEL board so as to compensate the time lag of transmission timing. Both U63 and U64 are the selectors to switch over two gate arrays as explained on page 1-6. The read pulse (1.789MHz) for the S-RAM's is called "DCLK". This pulse is obtained by dividing the oscillation frequency of U99, 28.63636MHz, by 16.

The timing of the related circuit is shown in Fig.1-9 on page 1-7.

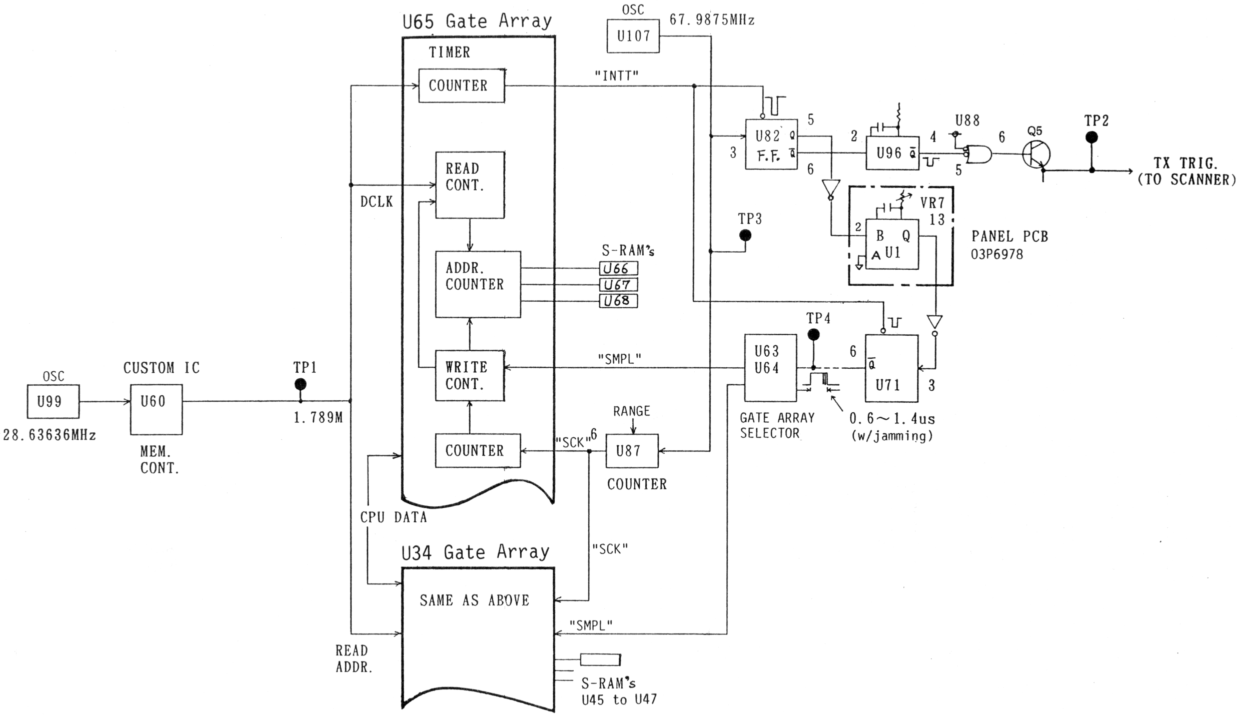

U65 Gate Array
TIMER
COUNTER
READ CONT.
ADDR. COUNTER
WRITE CONT.
COUNTER
OSC
U107
67.9875MHz
"INTT"
U82 F.F.
Q
Q̄
5
3
6
2
U96
4
U88
6
5
Q5
TP2
TX TRIG. (TO SCANNER)
VR7
13
B Q
A U1
PANEL PCB
03P6978
TP3
S-RAM's
U66
U67
U68
DCLK
OSC
U99
28.63636MHz
CUSTOM IC
U60
MEM. CONT.
TP1
1.789M
"SMPL"
U63
U64
GATE ARRAY SELECTOR
TP4
6
Q̄
U71
3
0.6～1.4us (w/jamming)
RANGE
"SCK"
6
U87
COUNTER
CPU DATA
U34 Gate Array
"SCK"
SAME AS ABOVE
"SMPL"
READ ADDR.
S-RAM's
U45 to U47

Fig.1-16

I/O Control

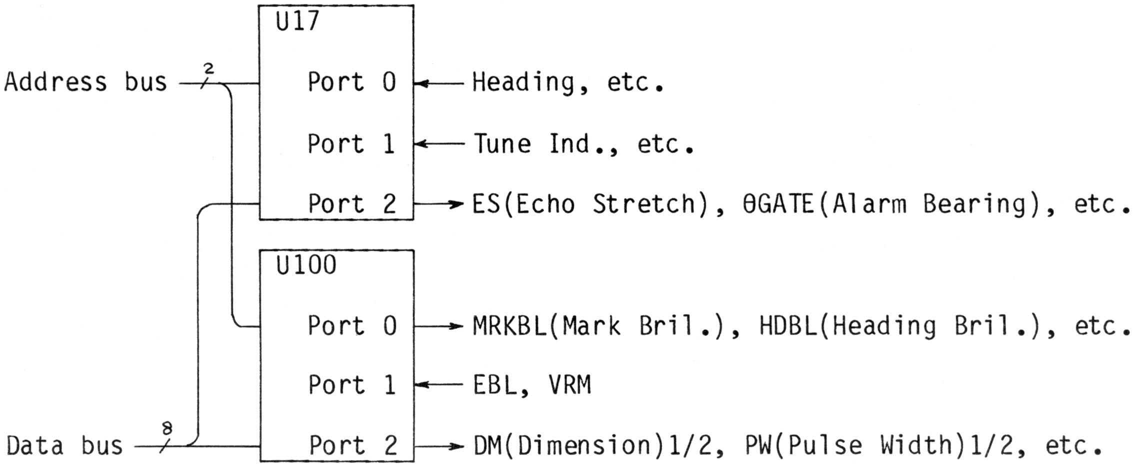
Refer to Fig.1-19 on page 1-17.

Z-80 CPU and its associated parts shown below are used to control almost circuit.

CPU (U16) : uPD70008AC-6
ROM (U15) : MBM27C256-25
RAM (U18) : uPD4464C-15L
I/O (U17, U100) : uPD71055C Programmable Peripheral Interface
Timer (U7) : uPD71054C Programmable Interval Timer

The CPU accepts the following interrupt request ($\overline{\text{INT}}$), i.e., gyro, timer and power failure interruptions. The latest gyro data is fetched to get true bearing. The periodical timer interruption is caused by the DCLK (1.789MHz) clock pulse to read/write a device which cannot issue an interrupt request, such as the touchpad keyboard. As for power failure interruption, see page 1-3. Another interruption to the CPU is $\overline{\text{NMI}}$ (Non Maskable Interrupt), which has a higher priority than $\overline{\text{INT}}$. The "Scan" signal explained on page 1-12 is applied to the $\overline{\text{NMI}}$ terminal in order to know the antenna direction.

U17 and U100 are I/O ports, which contains three stages of parallel ports and one control register. When viewed from CPU U16, the three ports are read/write ports and the control register is a write-only-register. They are accessed from the CPU by using two LSB's of the address bus. Fig.1-17 shows the input/output data at each port. They are individually referred to Fig.1-6, 1-11, 1-13, 1-14 and 1-19.



Address bus
2
U17
Port 0
Port 1
Port 2
Heading, etc.
Tune Ind., etc.
ES(Echo Stretch), θGATE(Alarm Bearing), etc.
U100
Port 0
Port 1
Port 2
MRKBL(Mark Bril.), HDBL(Heading Bril.), etc.
EBL, VRM
DM(Dimension)1/2, PW(Pulse Width)1/2, etc.
Data bus
8

Fig.1-17

The key closure status of the touchpad keyboard is read by the CPU through 8-1 data selectors U1 to U3. The 8-bit DIP switch setting is also read through the same selector U14.

The gyro serial data and its shift clock pulse (synchro pulse) coming from optional Gyro Converter GC-1 (or AD-10S) are applied to photo couplers U110 and U112, respectively. Output data from U110 is pushed into shift resisters U33 and U26 in this order. When 16-bit gyro data are shifted into the resisters, the shift clock supply stops for a while and the retriggerable one-shot multivibrator (U5) output goes down. This causes an interrupt for the CPU to fetch the data. Fig.1-18 shows the gyro data fetch timing.

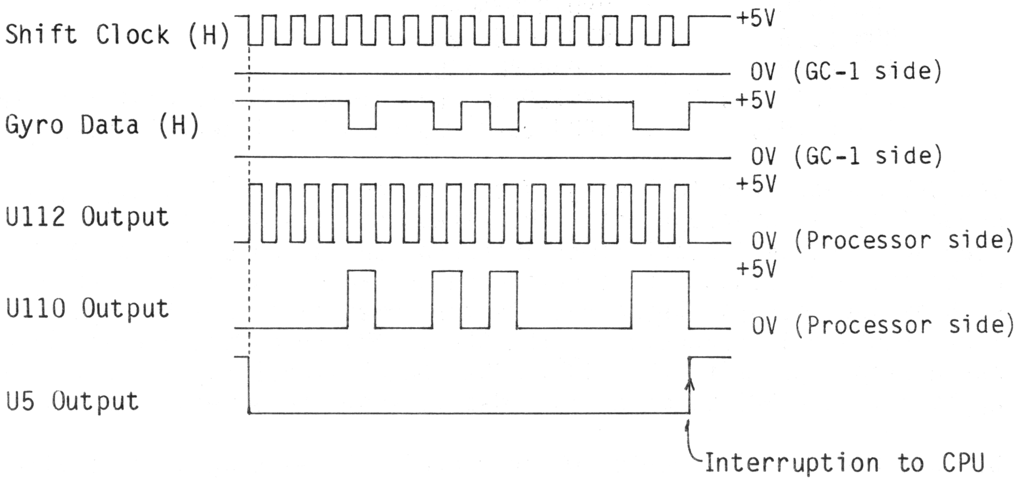
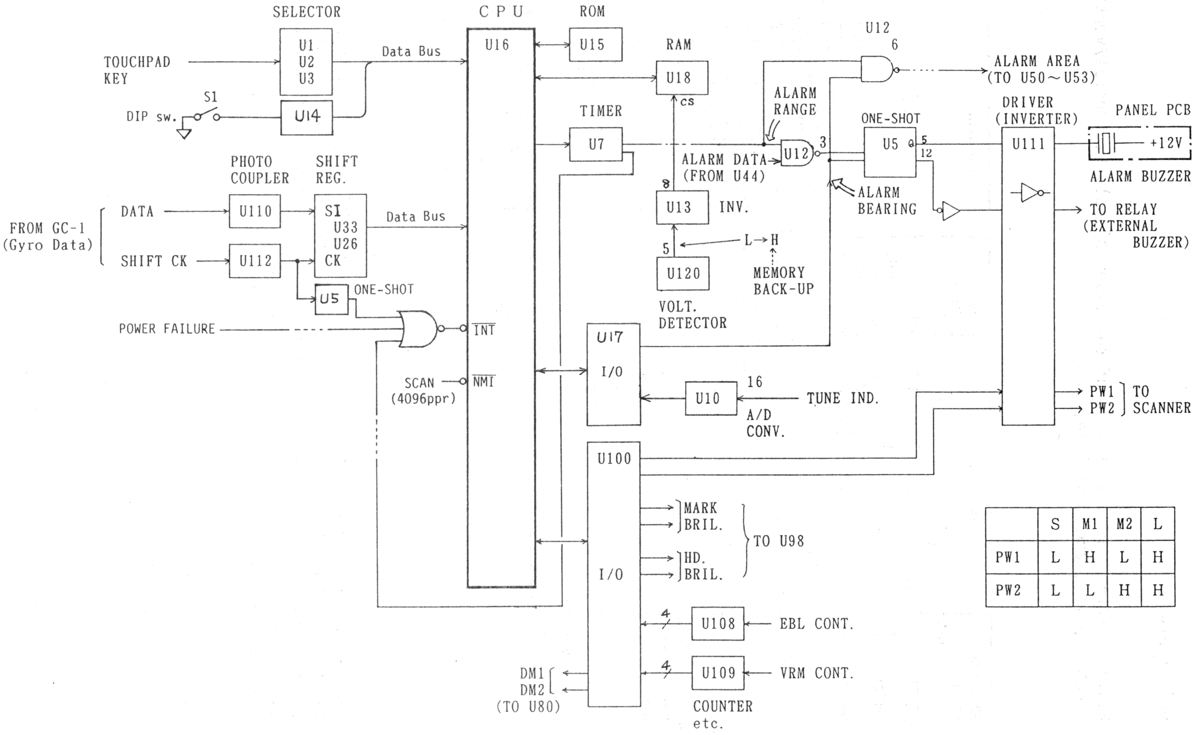

Shift Clock (H)
+5V
0V (GC-1 side)
Gyro Data (H)
+5V
0V (GC-1 side)
U112 Output
+5V
0V (Processor side)
U110 Output
+5V
0V (Processor side)
U5 Output
Interruption to CPU

Fig.1-18

As for alarm, presentation of an alarm area and generation of alarm sound are required. The alarm range and bearing signals are NAND-gated by U12 in order to draw the alarm area on the screen. Then, the alarm area data is sent to D-RAM's for echo (U50 through U53). On the other hand, the alarm data ("5" or more in level) is necessary to sound alarm. The 1-bit data, therefore, come from selector U44 (see Fig.1-8), and are NAND-gated with the alarm range signal by U12 at first. In the next place, since the bearing data is also necessary, its output and the bearing signal are led to one-shot multivibrator U5. Output from U5 actuates an alarm buzzer mounted on the PANEL board.


SELECTOR
U1
U2
U3
TOUCHPAD
KEY
S1
DIP sw.
U14
Data Bus
C P U
U16
ROM
U15
RAM
U18
cs
TIMER
U7
U12
6
ALARM AREA
(TO U50～U53)
ALARM
RANGE
ALARM DATA
(FROM U44)
3
U12
8
U13
INV.
5
L→H
MEMORY
BACK-UP
U120
VOLT.
DETECTOR
ONE-SHOT
U5
5
12
ALARM
BEARING
DRIVER
(INVERTER)
U111
PANEL PCB
+12V
ALARM BUZZER
TO RELAY
(EXTERNAL
BUZZER)
PHOTO
COUPLER
SHIFT
REG.
FROM GC-1
(Gyro Data)
DATA
U110
SI
U33
U26
CK
Data Bus
SHIFT CK
U112
U5
ONE-SHOT
POWER FAILURE
INT
SCAN
(4096ppr)
NMI
U17
I/O
U10
16
TUNE IND.
A/D
CONV.
PW1
PW2
TO
SCANNER
U100
MARK
BRIL.
HD.
BRIL.
TO U98
I/O
4
U108
EBL CONT.
4
U109
VRM CONT.
COUNTER
etc.
DM1
DM2
(TO U80)

	S	M1	M2	L
PW1	L	H	L	H
PW2	L	L	H	H

Fig.1-19

1-3. CRT Display

Fig.1-20 shows the signal flow of the video signal, horizontal/vertical synchro pulses and +24V line.

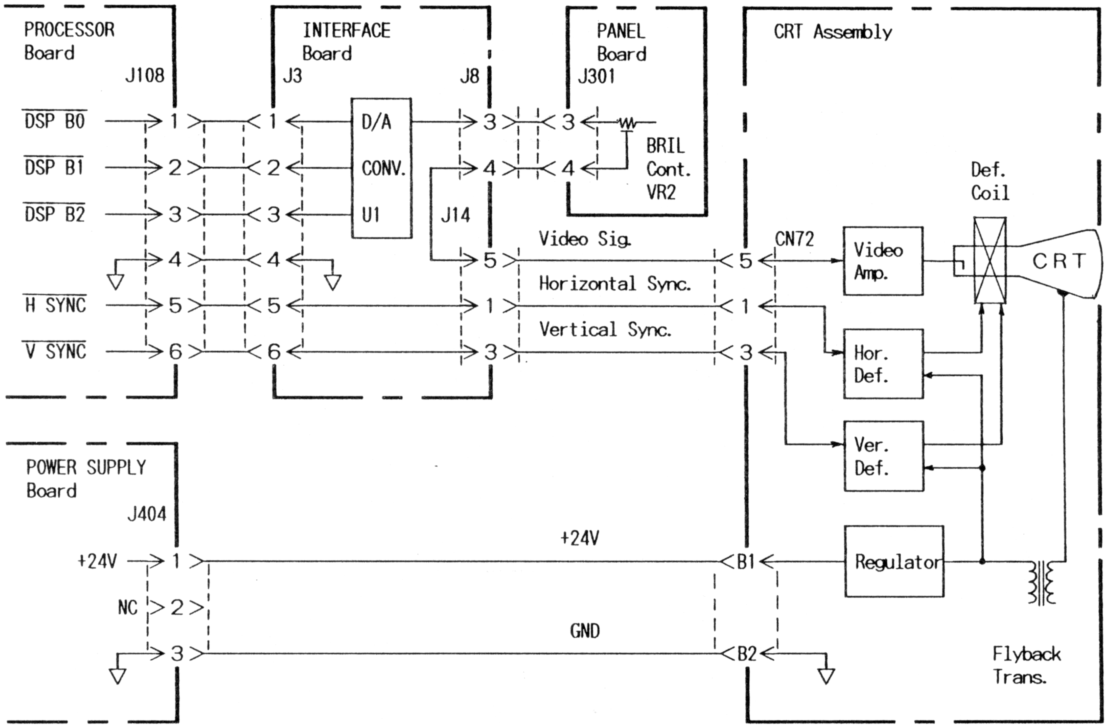
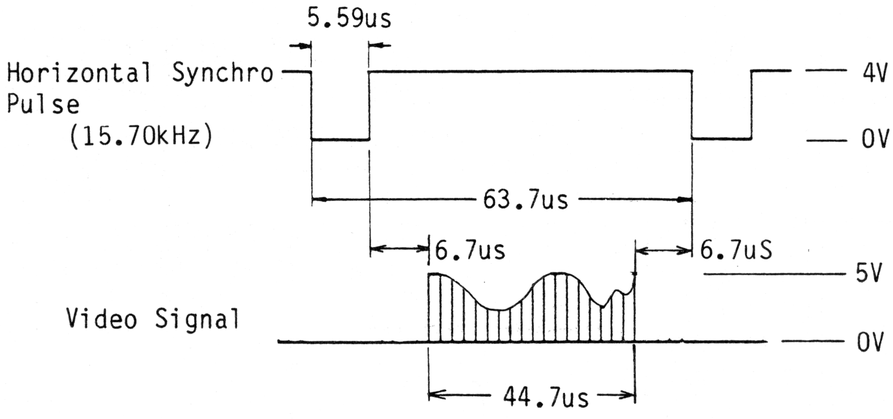

PROCESSOR Board
J108
DSP B0
DSP B1
DSP B2
H SYNC
V SYNC
1
2
3
4
5
6
INTERFACE Board
J3
J8
J14
D/A CONV. U1
PANEL Board
J301
BRIL Cont. VR2
CRT Assembly
CN72
Video Sig.
Horizontal Sync.
Vertical Sync.
Video Amp.
Hor. Def.
Ver. Def.
Def. Coil
CRT
POWER SUPPLY Board
J404
+24V
NC
+24V
GND
B1
B2
Regulator
Flyback Trans.

Fig.1-20

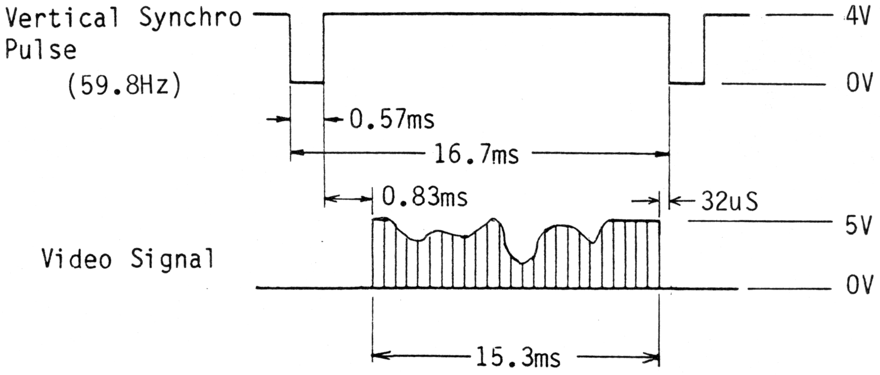
The 3-bit video data, i.e., $\overline{\text{DSP B0}}$, $\overline{\text{DSP B1}}$ and $\overline{\text{DSP B2}}$, are converted into analogue signal by D/A converter U1 at the INTERFACE board. The converted video signal passes through VR2 (BRIL. Cont.) on the PANEL board and is sent to the CRT assembly through the INTERFACE board. Then, the video signal is amplified up to the level enough to drive the CRT, and delivered to the cathode of the CRT.

+24V line coming from the POWER SUPPLY board is regulated to get stable +22.5V at the CRT assembly.

The horizontal and vertical synchro pulses are generated by the Graphic Display Controller at the PROCESSOR board and are sent to the CRT assembly via the INTERFACE board to produce raster on the CRT in synchronism with the video signal. Fig.1-21 shows the timing chart between the horizontal/vertical synchro pulses and video signal.


5.59us
Horizontal Synchro Pulse
(15.70kHz)
4V
0V
63.7us
6.7us
6.7uS
5V
Video Signal
0V
44.7us

(a) Timing Chart Between Horizontal Synchro Pulse and Video Signal

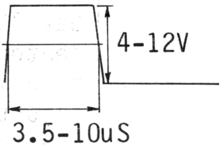
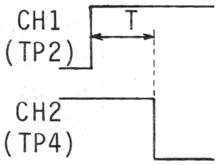
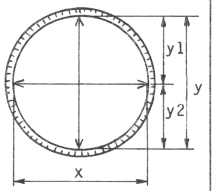

Vertical Synchro Pulse
(59.8Hz)
4V
0V
0.57ms
16.7ms
0.83ms
32uS
5V
Video Signal
0V
15.3ms

(b) Timing Chart Between Vertical Synchro Pulse and Video Signal

Fig.1-21 Synchro Pulses and Video Signal

CHAPTER 2. ADJUSTMENT

Item	Ratings	Measurement		
		P.C. Board	Point	Adjuster & Condition
+24V Regulated Volt.	23.8 to 24.2V	POWER SUPPLY PTU6982	⊕ J404 #1 ⊖ J404 #3	Adjust VR1 on POWER SUPPLY pcb.
Overvoltage Protection	40.1 to 45.0V (24/32V mains)	FILTER 03P6983	⊕ DTB-I #1 ⊖ DTB-I #2	Gradually increase ship's mains and check the voltage when operation stops.
	17.0 to 19.0V (12V mains)			
+5V Line Volt.	4.75 to 5.25V	INTERFACE 03P6980	⊕ J5 #4 ⊖ J5 #2	Transmit on 48nm range and confirm each line voltage.
+12V Line Volt.	11.8 to 13.0V		⊕ J5 #6 ⊖ J5 #2	
-12V Line Volt.	-11.8 to -13.0V		⊕ J5 #1 ⊖ J5 #2	
+35V Line Volt.	30 to 36V		⊕ J5 #7 ⊖ J5 #2	
+9V Heater Volt.	8.7 to 9.7V		⊕ J6 #3 ⊖ J6 #4	
Motor Volt.	20.7 to 25.3Vdc (123/200cm Ant.)		⊕ J6 #1 ⊖ J6 #2	
	24Vdc mains (240cm Ant.)			
TX High Volt.	250 to 270V (FR-1505D/DA)	Rear chassis	⊕ DTB-II ⊖ Chassis	
	290 to 310V (FR-1510D/DA)			
	500 to 520V (FR-1525D/DA)			
Pulse Rep. Rate	1950 to 2250Hz ("SP", "M1P")	PROCESSOR 03P6977	TP2	Confirmation only.
	1140 to 1260Hz ("M2P")			
	560 to 620Hz ("LP")			
	480 to 530Hz (on 96nm range)			

Item	Ratings	Measurement		
		P.C. Board	Point	Adjuster & Condition
TX Trigger Waveform		PROCESSOR 03P6977	TP2	Confirmation only.
TX Timing (Sample T)	 T ≦ 0.6uS (VR7: fully CCW) T ≧ 1.4uS (VR7: fully CW)	PROCESSOR 03P6977	TP2 (Ch.1) TP4 (Ch.2)	Use dual-trace oscilloscope and confirm "T" by turning VR7 on PANEL pcb.
GAIN Preset	5.5 ± 0.5V	PANEL 03P6978	⊕ TP1 ⊖ TP5	Set to 24nm range, ST-BY and turn GAIN control fully CW. Adjust VR9 on PANEL pcb.
STC Preset	4.5 ± 0.5V (DA-type) 4.2 ± 0.5V (D-type)	PANEL 03P6978	⊕ TP2 ⊖ TP5	Set to 24nm range, ST-BY and turn A/C SEA control fully CW. Adjust VR10 on PANEL pcb.
FTC Preset	6.3 ± 0.5V	PANEL 03P6978	⊕ TP3 ⊖ TP5	Set to 24nm range, ST-BY and turn A/C RAIN control fully CCW. Adjust VR11 on PANEL pcb.
Focus	Range rings and characters can be seen clearly.	CRT		Turn PANEL DIM control fully CW, and adjust VR64 on DEFLECTION pcb for CRT.
Picture Size	 x, y = 187-193mm |y1 - y2| ≦ 2mm	CRT		Turn on RANGE RING touchpad, and adjust VR31 (V-HEIGHT) and VR33 (V-LIN) on DEFLECTION pcb for CRT.

Item	Ratings	Measurement		
		P.C. Board	Point	Adjuster & Condition
Tuning	Tuned at mid-travel of TUNE control.	CRT		Set TUNE control to center position and transmit on 48nm range. Adjust VR12 on PANEL pcb for best tuning.
Tuning Indicator Sensitivity	Four tuning markers light up with the fifth marker blinking when tuned.	CRT		Transmit on maximum range and tune. Adjust VR8 on PANEL pcb.
Echo Stretch	Noise level should be same when turning ECHO STRETCH touchpad on/off.	CRT		Transmit on 24nm range and adjust GAIN control so that speckled back-ground noise is just visible. Adjust VR1 on PROCESSOR pcb.
Oscillation Frequency	1.77 to 1.81MHz (DCLK)	PROCESSOR 03P6977	TP1	Confirmation only.
	67.3 to 68.7MHz (SMPL CLK)		TP3	

CHAPTER 3 PARTS LOCATION

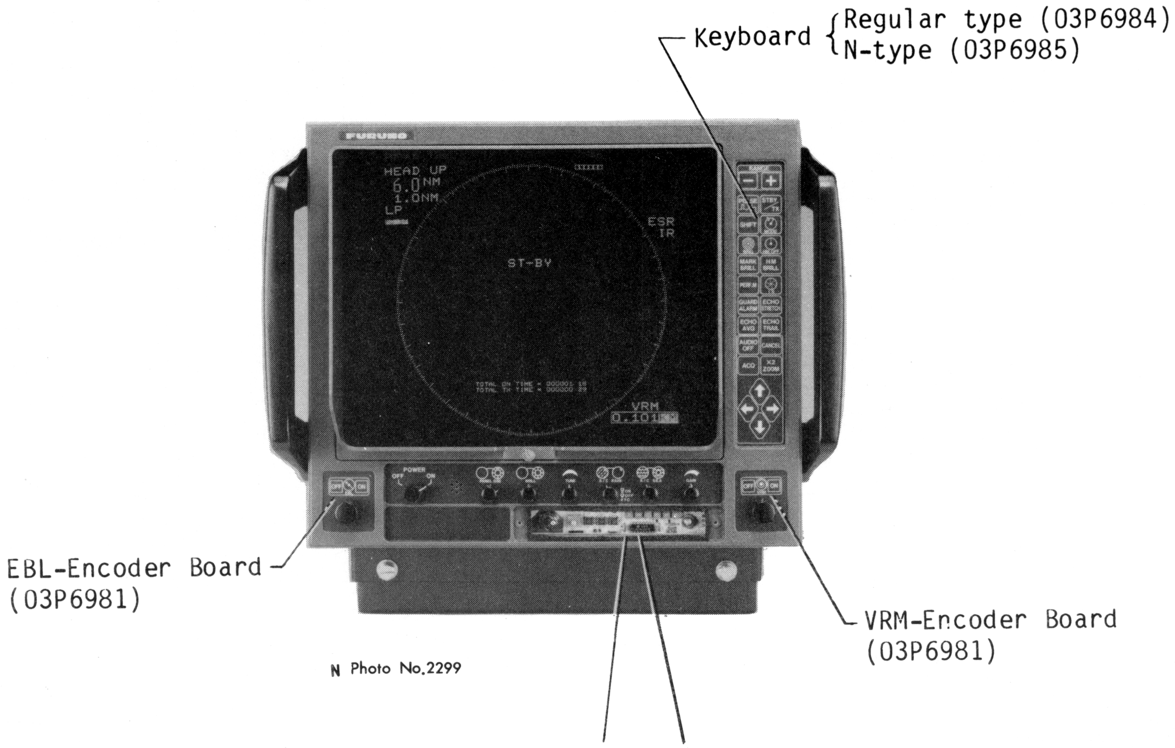
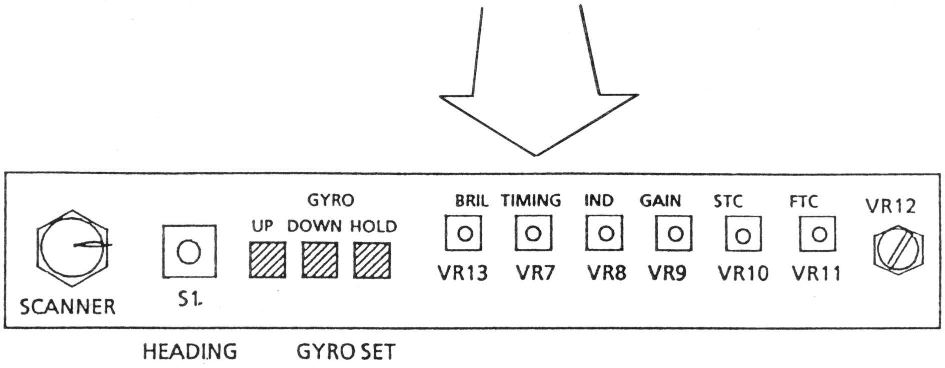

Keyboard {Regular type (03P6984)
N-type (03P6985)
EBL-Encoder Board
(03P6981)
VRM-Encoder Board
(03P6981)
N Photo No.2299

Fig. 3-1 Display Unit Front View with Preset Cover removed


SCANNER
S1
GYRO
UP
DOWN
HOLD
BRIL
TIMING
IND
GAIN
STC
FTC
VR12
VR13
VR7
VR8
VR9
VR10
VR11
HEADING
GYRO SET

Preset Compartment

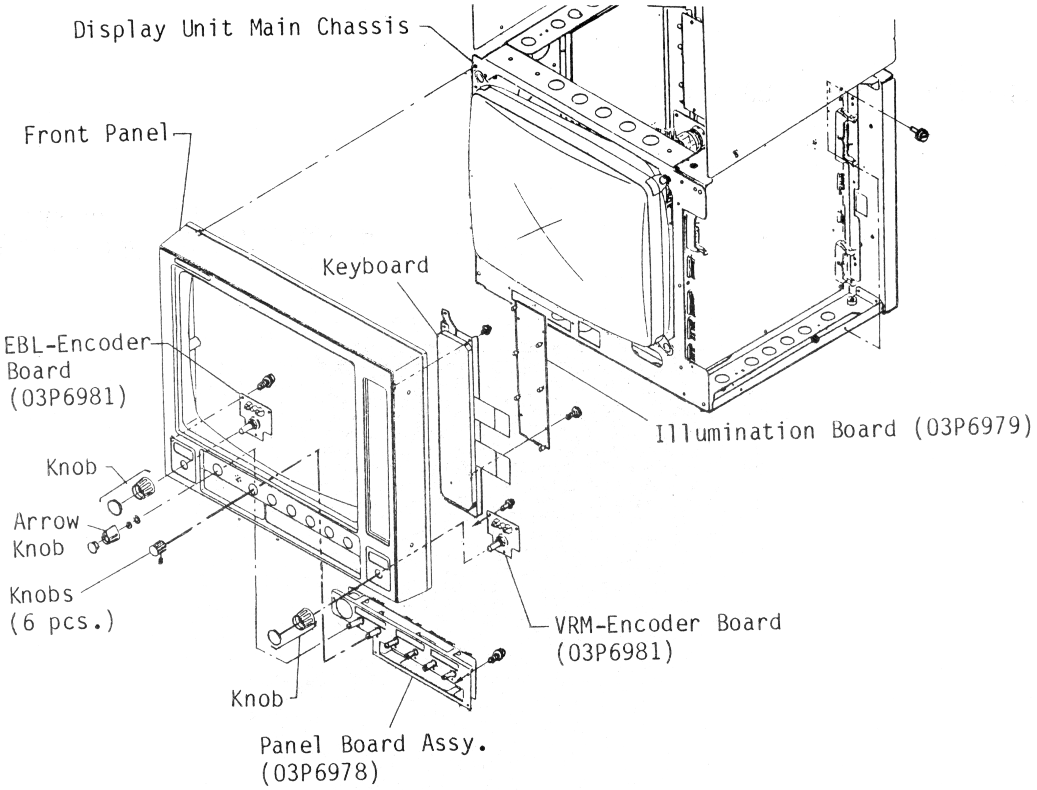

Display Unit Main Chassis
Front Panel
Keyboard
EBL-Encoder Board (03P6981)
Knob
Arrow Knob
Knobs (6 pcs.)
Illumination Board (03P6979)
VRM-Encoder Board (03P6981)
Knob
Panel Board Assy. (03P6978)

Fig. 3-2 Exploded View of Front Panel

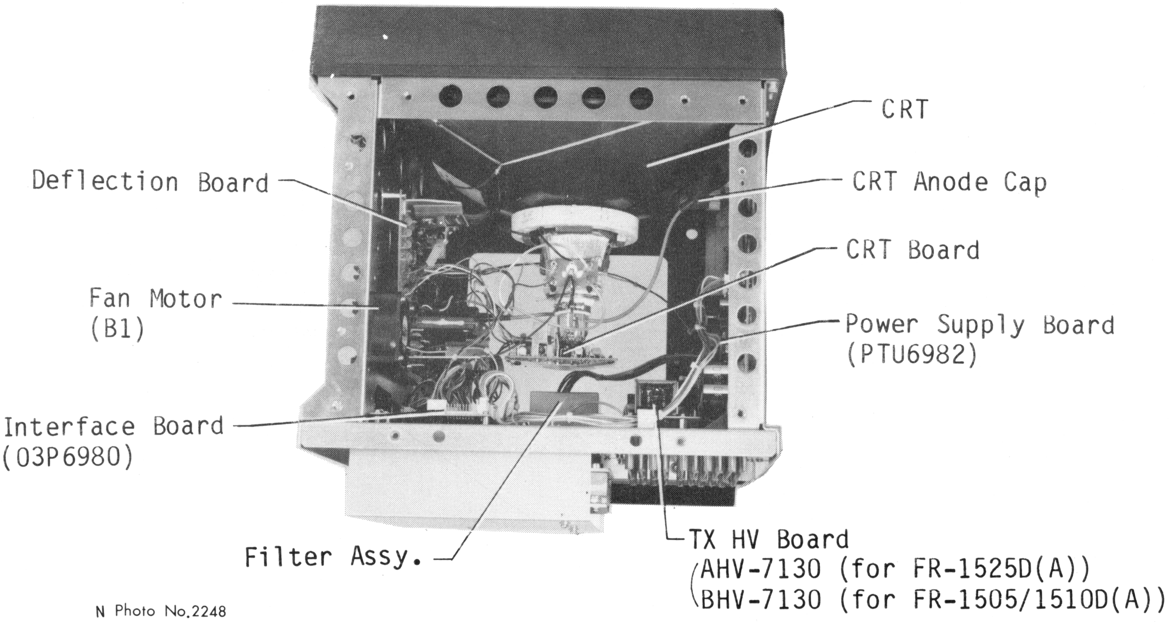
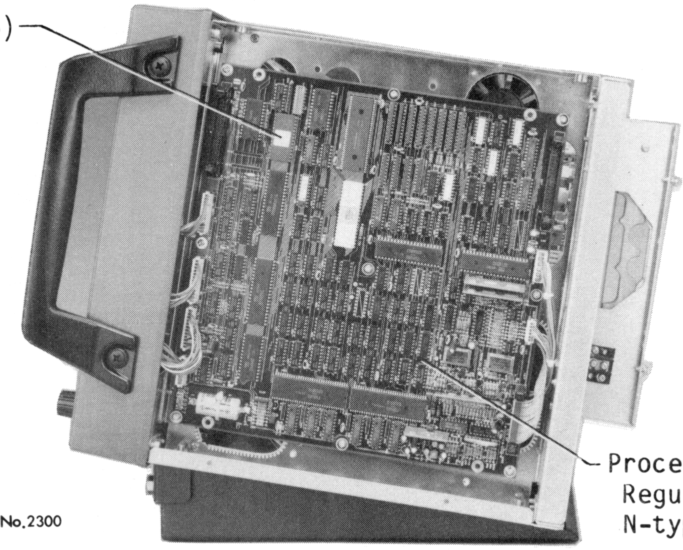

CRT
Deflection Board
CRT Anode Cap
CRT Board
Fan Motor (B1)
Power Supply Board (PTU6982)
Interface Board (03P6980)
TX HV Board
AHV-7130 (for FR-1525D(A))
BHV-7130 (for FR-1505/1510D(A))
Filter Assy.
N Photo No.2248

Fig. 3-3 Display Unit Top View

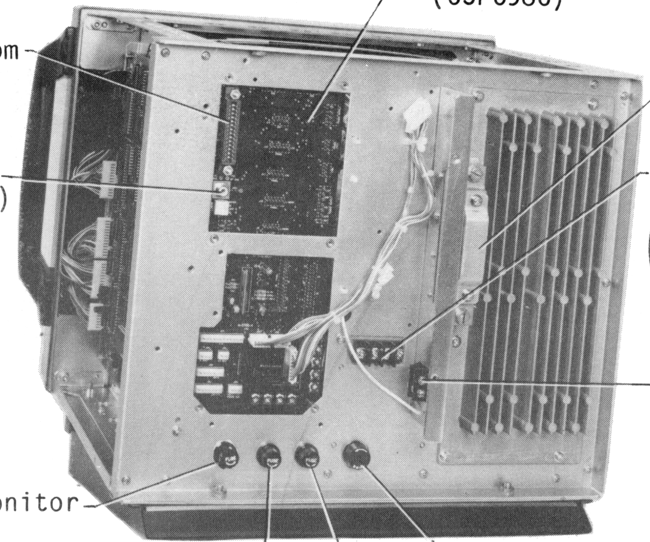


ROM (U15)

Processor Board
Regular type (03P6977 $\boxed{A}$)
N-type (03P6977 $\boxed{B}$)

N Photo No.2300

Fig. 3-4 Display Unit Side View



Interface Board
(03P6980)

Connector for Cable from
Scanner Unit (DJ-1)

Connector for Cable from
Scanner Unit (Video Line)
(J201)

Cable Clamp

DTB-1
(for ship's mains
#1--(+)
#2--(-))

DTB-2
(for TX HV)

Fuse for Performance Monitor
F2 (0.5A)

Fuse for Scanner Motor
F1352 (5A)

Fuse for Ship's Mains
F1351 $\begin{cases}\text{25A (for 12VDC)}\\\text{10A (for 24/32VDC)}\end{cases}$

Fuse for TX HV
F1 (0.5A)

N Photo No.2246

Fig. 3-5 Display Unit Rear View with Rear Cover Removed

PART 2

SCANNER UNIT

CONTENTS

* * * * * *

Page

GENERAL INFORMATION 0-1

CHAPTER 1. BLOCK DESCRIPTION 1-1 to 1-12

1-1. Modulator Trigger 1-1
1-2. Modulator 1-4
1-3. Duplexer and Mixer 1-6
1-4. IF Amplifier 1-7
1-5. STC 1-10
1-6. Bearing Signal Generator 1-12

CHAPTER 2. ADJUSTMENT 2-1

CHAPTER 3. PARTS LOCATION 3-1 to 3-3

GENERAL INFORMATION

The scanner unit contains the following p.c.boards. Most of them, except for the BEARING SIG. GEN. board, are different among models.

Table 0-1 P.C.Board Convertibility

P. C. Board			Model FR-					
Name	Type	Code No.	1505D	1505DA	1510D	1510DA	1525D	1525DA
BEARING SIGNAL GENERATOR	MP-3795	008-312-370	o	o	o	o	o	o
MODULATOR	03P5686	008-311-010	o	o	o	o		
	MD-5145	008-200-160					o	o
MOD. TRIGGER	03P5732	008-310-990	o	o	o	o		
	RF-5144	008-200-170					o	o
IF AMPLIFIER / STC ASSEMBLY	BIF-4879 + BSTC-6995	008-103-180	o		o		o	
	BIF-5668 + ASTC-6995	008-103-190		o		o		o

The following table shows the major components used for the scanner unit.

Table 0-2 Major Components

Model / Item	FR-1505D	FR-1505DA	FR-1510D	FR-1510DA	FR-1525D	FR-1525DA
RF Transceiver Module	RTR-013	RTR-013A	RTR-014	RTR-014A	RTR-015	RTR-015A
Antenna Radiator	XN2, XN3 or XN3A		XN2, XN3, XN3A or XN4A			
Magnetron	9M502/E3526		9M602		M5187(F) (or 9M752)	
Diode Limiter	ND702B-1 (or S-LX5B)				S-LX5B	
MIC	RU-5072					
Circulator	RC-3686					
Pulse Trans.	RT-4427-1				RT-4037-4	
Choke Coil	RL-3772-3				RL-4036-2	
SCR	SH5J12U (1 pc.)				SH16J12U (2 pcs.)	
Scanner Motor	D8G-516 30W DC24V					
Fan Motor	Not provided				FBP-08B24LZ	

CHAPTER 1. BLOCK DESCRIPTION

1-1. Modulator Trigger

03P5732 for FR-1505D(DA) and FR-1510D(DA)

See Fig.1-1. The modulator trigger circuit, consisting of Q850, Q854, Q853 and U850, generates pulses that fire the modulator SCR (CR813).

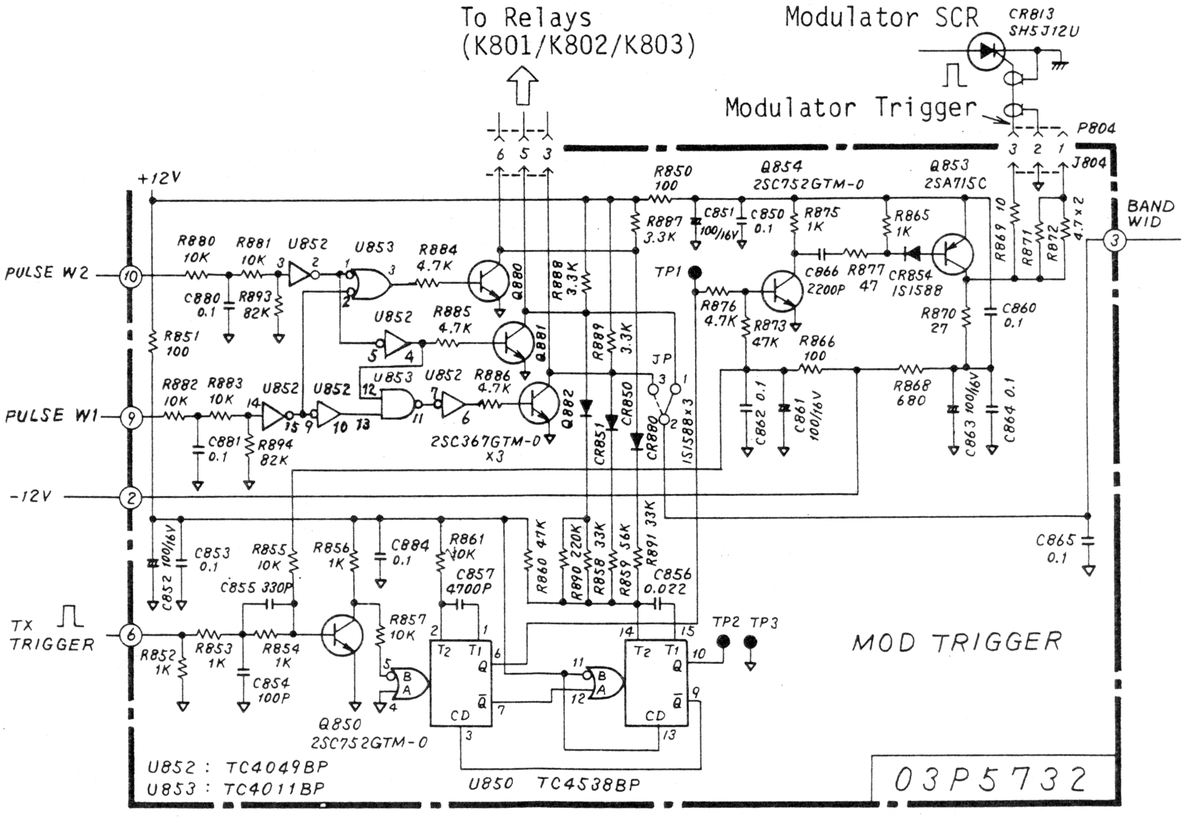

To Relays
(K801/K802/K803)
Modulator SCR
CR813
SHSJ12U
Modulator Trigger
P804
J804
BAND WID
+12V
-12V
PULSE W2
PULSE W1
TX TRIGGER
R850 100
Q854 2SC752GTM-O
Q853 2SA715C
R887 3.3K
C851 100/16V
C850 0.1
R875 1K
R865 1K
TP1
C866 2200P
R877 47
CR854 1S1588
R876 4.7K
R873 47K
R866 100
R870 27
C860 0.1
R868 680
C862 0.1
C861 100/16V
C863 100/16V
C864 0.1
R869 10
R871
R872
4.7×2
R880 10K
R881 10K
U852
U853
R884 4.7K
Q880
R888 3.3K
C880 0.1
R893 82K
R885 4.7K
Q881
R851 100
R889 3.3K
JP
R882 10K
R883 10K
R886 4.7K
Q882
2SC367GTM-O ×3
CR851
CR850
CR880
1S1588×3
C881 0.1
R894 82K
C852 100/16V
C853 0.1
R855 10K
C855 330P
R856 1K
C884 0.1
R861 10K
C857 4700P
R860 47K
R890 220K
R858 33K
R859 56K
R891 33K
C856 0.022
C865 0.1
TP2 TP3
MOD TRIGGER
R852 1K
R853 1K
R854 1K
C854 100P
R857 10K
Q850 2SC752GTM-O
T2 T1 Q Q̄ CD
U852 : TC4049BP
U853 : TC4011BP
U850 TC4538BP
03P5732

Fig.1-1 Modulator Trigger (03P5732)

Normally the circuit is stable with Q850/Q853 off. Q850 turns on upon receiving the TX trigger from the display unit and this causes a negative going pulse to be produced at its collector. Then, a positive going pulse is produced at pin #6 of U850 and sent to Q854, and then a negative going pulse is generated at the collector of Q854. The negative going pulse is differentiated by C866 and R865, and then only a negative going differentiated waveform is applied to the base of Q853 as shown in Fig.1-2. As a result, a positive going pulse (Modulator Trigger Pulse) is produced at the collector of Q853 and delivered to the gate of modulator SCR CR813.

The circuit made up of U850 and Q854 prevents the modulator from being fired by noise. The first stage of the one-shot multivibrator U850 operates immediately after the TX trigger pulse, and next the second stage of U850 operates. The output (#9) of U850 is applied to the reset terminal (#3) of the first stage of U850. In this manner, the level at pin #6 of U850 is kept "L" while the level at pin #9 of U850 is "L". Therefore, even if noise appears after the TX trigger pulse, Q853 is kept off.

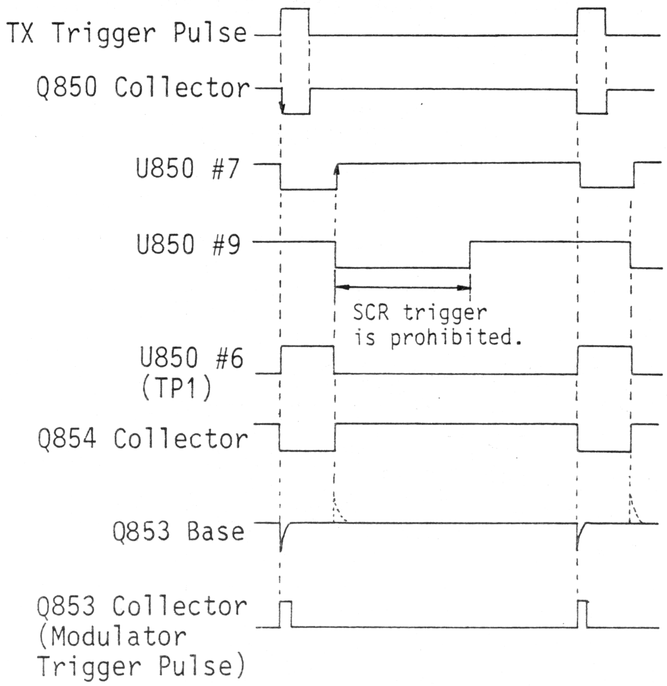

TX Trigger Pulse
Q850 Collector
U850 #7
U850 #9
SCR trigger is prohibited.
U850 #6 (TP1)
Q854 Collector
Q853 Base
Q853 Collector (Modulator Trigger Pulse)

Fig.1-2

The circuit made up of U852, U853, Q880, Q881 and Q882 operates as a decoder to drive the relays for changing the TX pulselength depending on the settings of the RANGE and PULSE touchpads. Refer to the truth table 1-1 shown below.

Table 1-1 Truth Table

Pulselength	S	M1	M2	L
PULSE W2	L	L	H	H
PULSE W1	L	H	L	H
Relay K801	OFF	ON	ON	ON
Relay K802	OFF	OFF	ON	ON
Relay K803	OFF	OFF	OFF	ON

RF-5144 for FR-1525D(DA)

This board consists of the modulator trigger circuit and the switching circuit for the magnetron heater voltage. Since the operation of the modulator trigger circuit is the same as FR-1505/1510D(DA), only the circuit description of the switching circuit for the magnetron heater voltage is mentioned here. See Fig.1-3.

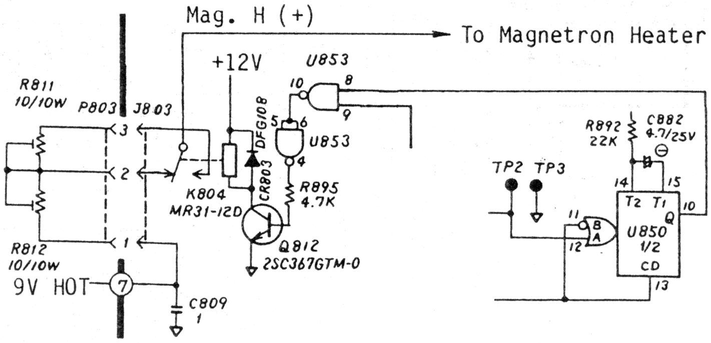

Mag. H (+)
To Magnetron Heater
+12V
U853
10
8
9
R811
10/10W
P803
J803
3
2
1
DFG108
5
6
U853
4
CR803
R895
4.7K
K804
MR31-12D
Q812
2SC367GTM-0
R812
10/10W
9V HOT
7
C809
1
R892
22K
C882
4.7/25V
TP2
TP3
14
15
T2
T1
Q
10
11
12
B
A
U850
1/2
CD
13

Fig.1-3 Switching Circuit

On short ranges, Q812 is cut off since the level at pin #9 of U853 is kept low. Therefore, relay K804 is not activated, and the voltage of "9V HOT" is passed through R812/K804 and applied to the magnetron as a magnetron heater voltage. On the contrary, Q812 becomes conductive on middle/long ranges since the both levels at pins #8 and #9 of U853 go high under transmission condition, causing the voltage of "9V HOT" to pass through R812/R811/K804 in order. As the result, the less magnetron heater voltage is applied to the magnetron.

1-2. Modulator

03P5686 for FR-1505D(DA) and FR-1510D(DA)

The modulator circuit produces a narrow high tension pulse that drives the magnetron. It is composed of a line-type-pulser as shown in Fig.1-4.

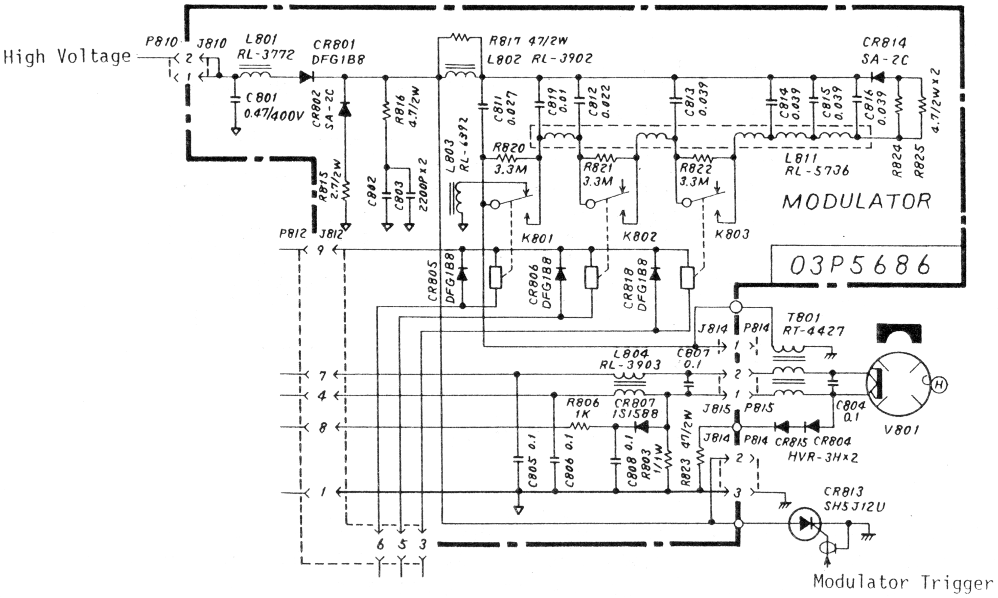

High Voltage
P810
J810
L801
RL-3772
CR801
DFG1B8
C801
0.47/400V
CR802
SA-2C
R816
4.7/2W
R815
2.7/2W
C802
C803
2200P x 2
P812
J812
R817 47/2W
L802 RL-3902
L803
RL-6392
C811
0.027
C819
0.01
C812
0.022
C813
0.039
C814
0.039
C815
0.039
C816
0.039
CR814
SA-2C
4.7/2W x 2
R824
R825
R820
3.3M
R821
3.3M
R822
3.3M
L811
RL-5736
MODULATOR
K801
K802
K803
03P5686
CR805
DFG1B8
CR806
DFG1B8
CR818
DFG1B8
T801
RT-4427
J814
P814
L804
RL-3903
C807
0.1
R806
1K
CR807
1S1588
J815
P815
C804
0.1
V801
CR815 CR804
HVR-3H x 2
C805 0.1
C806 0.1
C808 0.1
R803
1/1W
R823 47/2W
CR813
SH5J12U
Modulator Trigger
9
7
4
8
1
6
5
3
2

Fig.1-4 Modulator (03P5686)

L801 is the charging choke, which forms a series resonant circuit with the pulse forming network (PFN) consisting of C811 thru C816, C819 and L811. The TX high voltage in the input is doubled by the electromotive force of this coil and the PFN is charged up to twice the input voltage. The time taken for full charge is roughly calculated by the equation $T = 2\pi\sqrt{L \times C}$, where L and C represent L801 and capacitors of the PFN.

The PFN is a concentrated constant L-C circuit, which is an application of parallel two-line circuits with an open end. The modulation pulse that drives the magnetron develops when the energy stored in the PFN is discharged through CR813. Duration of the pulse is equal to the time required for the voltage wave to go and return in the L-C network, and it is given by duration $t = 2N\sqrt{L \times C}$, where N is the number of sections of the L-C network.

CR801 prevents the energy stored in the PFN from discharging to the input line. The advantage of employing CR801 is to allow a wide choice of CR813 firing timings and to get efficient utilization of stored energy; CR813 can be fired at any time after the PFN is charged to peak and fluctuation of trigger timing does not affect the amplitude of the pulse.

The pulse transformer T801 boosts up the pulse produced by the PFN. Since the characteristic impedance of the PFN and the input impedance of T801 match (about three ohms), a pulse with half of the network voltage is developed across T801's primary winding. T801 boosts up this pulse by 25 times and applies the resultant output to the magnetron, which oscillates at 9410MHz.

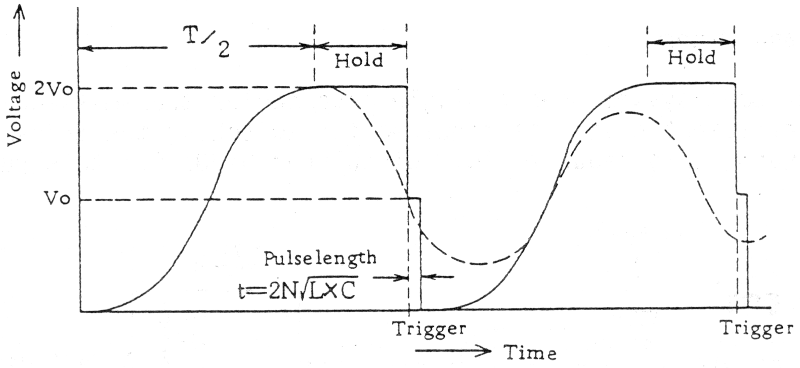


Fig.1-5

L802 holds down the rising speed of CR813 current below a certain level in order to minimize energy loss wasted by heat. CR802 and R815 absorb the counter electromotive force that develops at the moment CR813 turns off, protecting CR813 from damage. CR804 and CR815 absorb ringing of pulse in the secondary of T801. C804 decouples the pulse energy that is liable to occur across the magnetron heater when T801 secondary windings are unbalanced or the load is asymmetric.

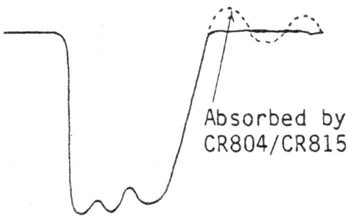

Absorbed by
CR804/CR815

Fig.1-6

MD-5145 for FR-1525D(DA)

The modulator circuit is shown in Fig.1-7. The operation of this circuit is basically same as FR-1505/1510D(DA) with the following exceptions.

Page	Item	FR-1505/1510D(DA)	FR-1525D(DA)
1-4	Paragraph 5	T801 boosts up this pulse by 25 times ---	T801 ------- by 18 times ---

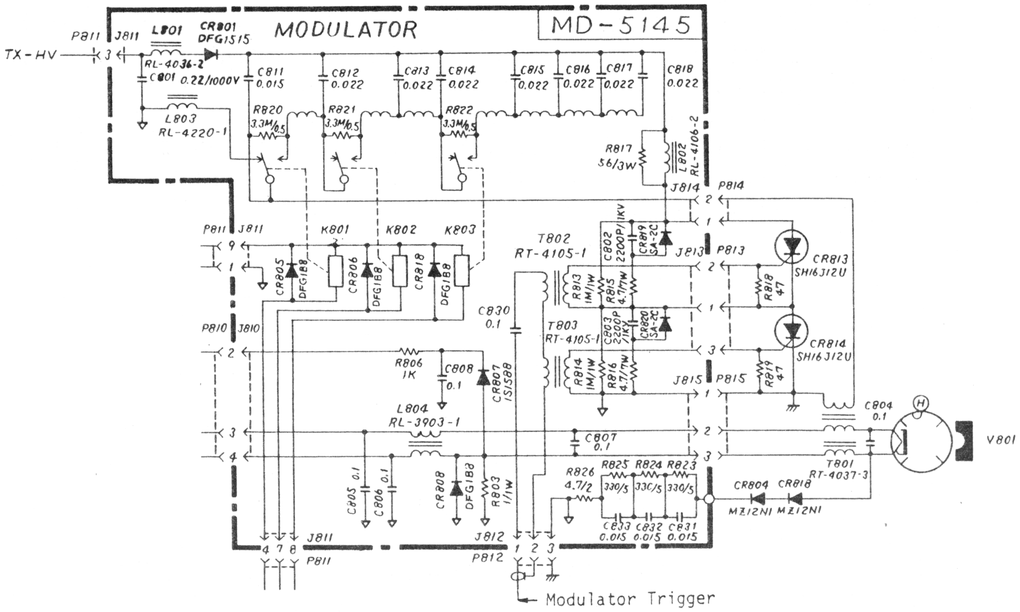

MODULATOR
MD-5145
TX-HV
P811
J811
L801
RL-4036-2
CR801
DFG1515
C801 0.22/1000V
L803
RL-4220-1
C811 0.015
C812 0.022
C813 0.022
C814 0.022
C815 0.022
C816 0.022
C817 0.022
C818 0.022
R820 3.3M/0.5
R821 3.3M/0.5
R822 3.3M/0.5
R817 56/3W
L802 RL-4106-2
J814
P814
K801
K802
K803
CR805 DFG1B8
CR806 DFG1B8
CR818 DFG1B8
P810
J810
R806 1K
C808 0.1
CR807 1S1588
L804
RL-3903-1
C830 0.1
T802
RT-4105-1
T803
RT-4105-1
C802 2200P/1KV
CR819 SA-2C
C803 2200P/1KV
CR820 SA-2C
R813 1M/1W
R815 4.7/7W
R814 1M/1W
R816 4.7/7W
J813
P813
J815
P815
CR813 SH16J12U
CR814 SH16J12U
R818 47
R819 47
C804 0.1
H
V801
T801
RT-4037-3
C807 0.1
C805 0.1
C806 0.1
CR808 DFG1B8
R803 1/1W
R826 4.7/2
R825 330/5
R824 330/5
R823 330/5
C833 0.015
C832 0.015
C831 0.015
CR804 MZ12N1
CR818 MZ12N1
J811
P811
J812
P812
Modulator Trigger

Fig.1-7 Modulator (MD-5145)

1-3. Duplexer and Mixer

Since the radar system uses a single antenna for transmission and reception, an efficient device is required for switching the transmitter and the receiver. This radar employs circulator HY801 for this purpose. See Fig.1-8.

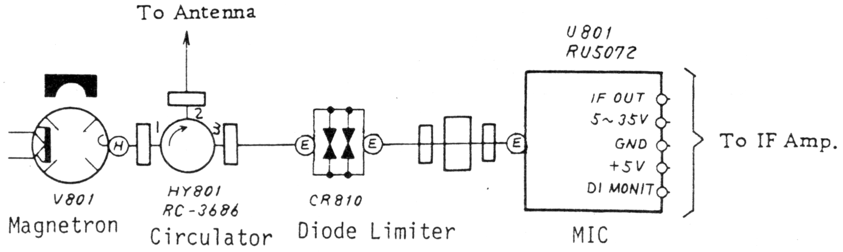


Fig.1-8

The circulator HY801 is a passive directional coupler with three ports. It contains a permanent magnet and a core of ferrite material and bends the electromagnetic wave in a specific direction. In Fig.1-8, the microwave energy produced by the magnetron enters the circulator from port 1 (TX). It is bent in the specific direction and emerges from port 2 (ANTENNA) with little loss, port 3 (RX) being isolated. In the same manner, the received signal entering into port 2 is transferred to port 3, isolating port 1. This operation of the circulator protects the receiver during transmission and minimizes loss of the received signal during reception.

The diode limiter is a self-activating switch made of two PIN diodes. Its function is to attenuate the strong transmission signals from the magnetron and from other boat radars through the antenna and to protect the MIC (Microwave IC) U801. The PIN diode has certain characteristics as shown in Fig.1-9 and conducts at a certain level of microwave power. When the diode is in the cut-off state, the input impedance of the diode limiter matches the impedance of the waveguide, and the microwave energy is delivered to the MIC. When the diode is put into a conductive state, the waveguide is short-circuited and most of the input energy is reflected back to the transmitter side. The strong signal is thus weakened down to about 50mW by the diode limiter.

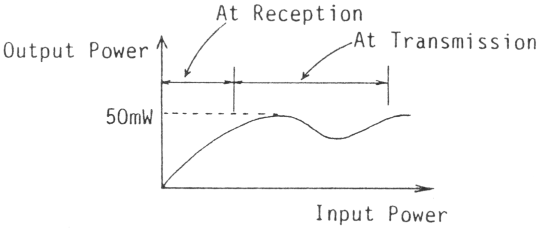


Fig.1-9

U801 is a MIC incorporating a local oscillator and mixer diodes. The received microwave signal of 9410MHz coming from the diode limiter is mixed with the local oscillation signal at the mixer diodes and converted into IF signal of 60MHz.

1-4. IF Amplifier

BIF-4879 for FR-1505D/1510D/1525D

See Fig.1-10. The IF signal of 60MHz coming from the MIC is amplified and converted into video signal, which is delivered to the display unit.

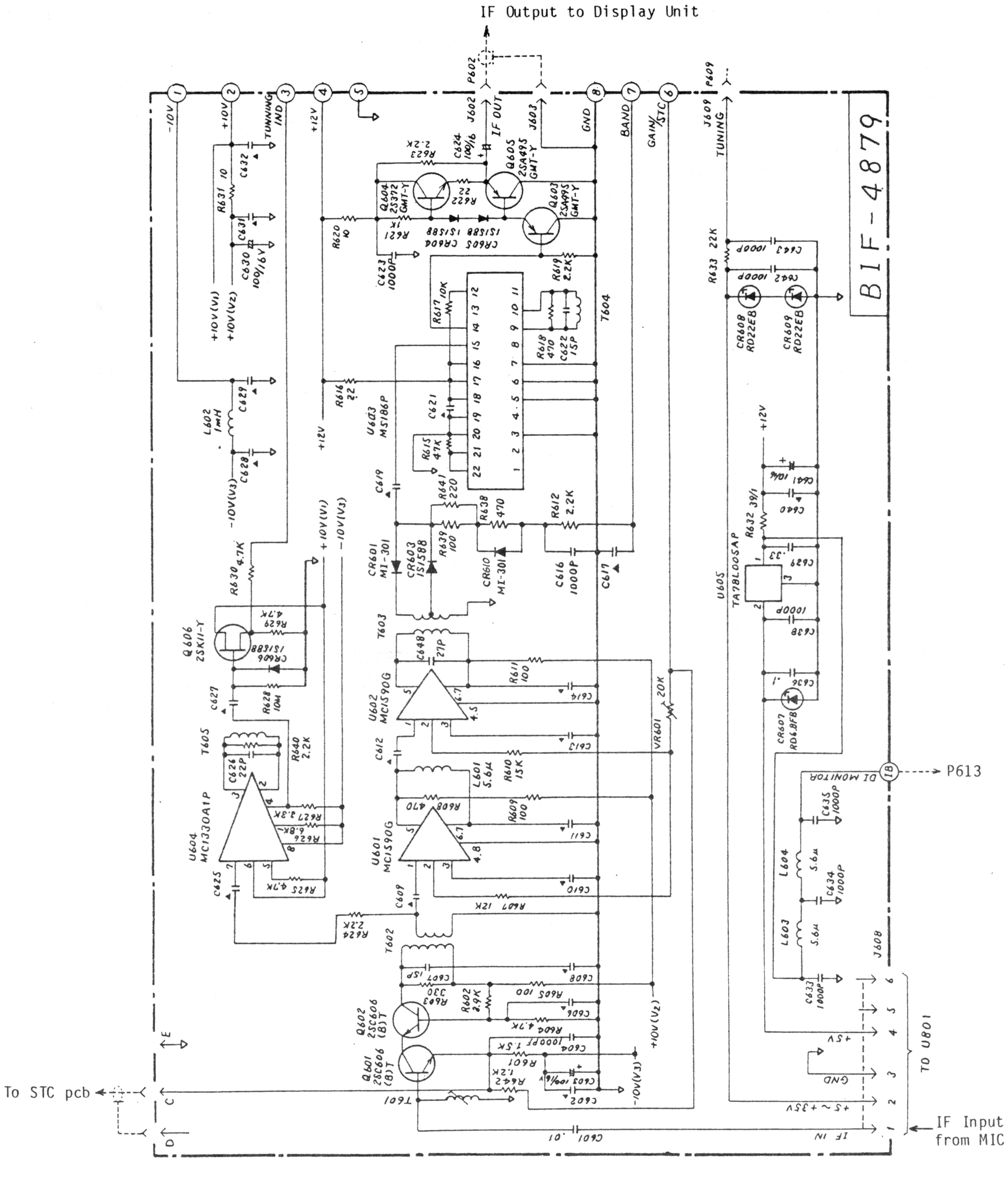

IF Output to Display Unit
P602
J602
IF OUT
J603
GND
BAND
GAIN/STC
P609
J609
TUNING
-10V
+10V
TUNING IND
+12V
BIF-4879
U603 MS186P
U602 MC1590G
U601 MC1590G
U604 MC1330A1P
U605 TA78L005AP
Q601 2SC606
Q602 2SC606
Q603 2SA495
Q604 2SC372
Q605 2SA495
Q606 2SK11-Y
T601
T602
T603
T604
T605
VR601 20K
DI MONITOR
P613
J608
TO U801
IF IN
+5V
GND
+5~+35V
To STC pcb
IF Input from MIC

Fig.1-10

The IF amplifier is composed of five major circuits; linear amplifier (Q601/Q602, U601/U602), video amplifier (Q603 thru Q605), bandpass selector (T603, CR601/CR603/CR610), tuning indicator circuit (U604, Q606) and voltage regulator (U605).

A signal applied to the base of Q601 is amplified by Q601 and Q602 in cascade, and sent to U601 via T602. Then, a signal amplified by U601 is furthermore amplified by U602 and detected by U603, and then amplified by Q603 thru Q605 and delivered to the display unit.

The IF amplifier operates in either narrow or wide bandwidth mode depending on the settings of the RANGE and PULSE touchpads. On short ranges, the impedance at the secondary winding of T603 decreases since CR601/CR610 are conductive and CR603 is cut off, resulting in selection of wide bandwidth (13MHz). On the contrary, CR601/CR610 are off and CR603 is on, selecting narrow bandwidth (3MHz) on middele/long ranges.

The IF signal of 60MHz amplified by Q601/Q602/U604 is detected by CR606. The detected signal is amplified in current by Q606 and applied to the tuning indicator circuit in the display unit.

U605 produces the +5V regulated voltage for the MIC. CR607 is employed to protect against overvoltage.

BIF-5668 for FR-1505DA/1510DA/1525DA

See Fig.1-11. The IF signal of 60MHz coming from the MIC is amplified and converted into video signal, which is delivered to the display unit. The IF amplifier is composed of five major circuits; linear amplifier (Q601/Q602, U601 thru U604), video amplifier (Q604/Q605), bandpass selector (T602, CR601/CR602/CR613), tuning indicator circuit (U605/U606, Q606) and voltage regulator (U607).

A signal applied to the base of Q601 is amplified by Q601 and Q602 in cascade, and sent to U601 via T602. Then, the signal amplified by U601 is amplified by U602 thru U604 and sent to Q604/Q605 where it is furthermore amplified, and then delivered to the display unit.

The IF amplifier operates in either narrow or wide bandwidth mode depending on the settings of the RANGE and PULSE touchpads. On short ranges, the impedance at the secondary winding of T602 decreases since CR601 is conductive and CR602/CR613 are cut off, resulting in selection of wide bandwidth (7MHz). On the contrary, CR601 is off and CR602/CR613 are on, selecting narrow bandwidth (3MHz) on middle/long ranges.

The IF signal of 60MHz coming from the MIC is amplified by U605/U606 and detected by CR607. The detected signal is amplified in current by Q606 and applied to the tuning indicator circuit in the display unit.

U607 produces the +5V regulated voltage for the MIC. CR610 is employed to protect against overvoltage.

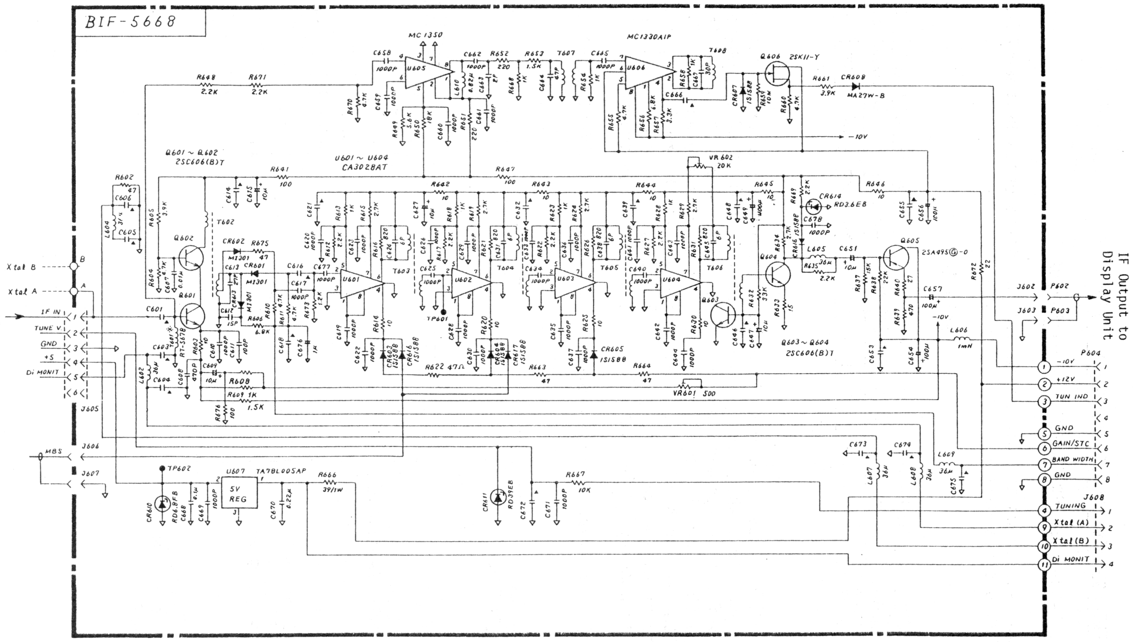

BIF-5668
MC1350
U605
MC1330A1P
U606
T607
T608
Q606 2SK11-Y
CR609 MA27W-B
R661 3.9K
R668 2.2K
R671 2.2K
-10V
Q601 ~ Q602 2SC606(B)T
U601 ~ U604 CA3028AT
R641 100
R647 100
R642 10
R643 10
R644 10
R645 10
R646 10
VR602 20K
CR614 RD36EB
Q605 2SA495(G)-O
R672 22
R640 27
R639 470
C657 100μ
L606 1mH
-10V
Q603 ~ Q604 2SC606(B)T
T602
T603
T604
T605
T606
U601
U602
U603
U604
Q601
Q602
Q603
Q604
CR601
CR602
M1301
TP601
R622 47Ω
R663 47
R664 47
VR601 500
R608
R609 1K
1.5K
Xtal B
Xtal A
B
A
IF IN
TUNE V.
GND
+S
Di MONIT
J605
J606
MBS
J607
TP602
U607 TA78L005AP
5V REG
R666 39/1W
CR610 RD6.8FB
CR611 RD9EB
R667 10K
C673
C674
L607 36μ
L608 36μ
L609 36μ
C675
J602
J603
P602
P603
IF Output to Display Unit
P604
① -10V 1
② +12V 2
③ TUN IND 3
4
⑤ GND 5
⑥ GAIN/STC 6
⑦ BAND WIDTH 7
⑧ GND 8
J608
④ TUNING 1
⑨ Xtal (A) 2
⑩ Xtal (B) 3
⑪ Di MONIT 4
IF Input from MIC

Fig.1-11

1-5. STC

BSTC-6995 for FR-1505D/1510D/1525D

ASTC-6995 for FR-1505DA/1510DA/1525DA

Fig.1-13 shows the STC circuit. The differences between ASTC and BSTC-6995 p.c.boards are listed below.

Table 1-2

	JUMP 1	JUMP 2	R1	R2	R9	R11	R21	R22	C11	R15	C27
BSTC6995 (D TYPE)	B	B	68Ω	27Ω	8.2kΩ	1.8kΩ	33Ω	——	3300PF	22kΩ	1800PF
ASTC6995 (DA TYPE)	A	A	56Ω	56Ω	6.8kΩ	1kΩ	22Ω	22k	8200PF	——	——

The STC circuit contains MBS/STC/FTC waveform generator U1. The TX trigger from the display unit is sent to pin #1 of U1, where two kinds of waveforms are generated; one is an MBS waveform at pin #9 (Fig.1-12(b)) and the other is an STC/FTC waveform at pins #16 and #17 (Fig.1-12(c)). Both waveforms are mixed and controlled at IF Amplifier p.c.board, and the resultant waveform shown in Fig.1-12(d) is obtained to suppress the main bang and gain just after the transmission trigger.

VR1 is provided to take MBS timing as shown in Fig.1-12(b).

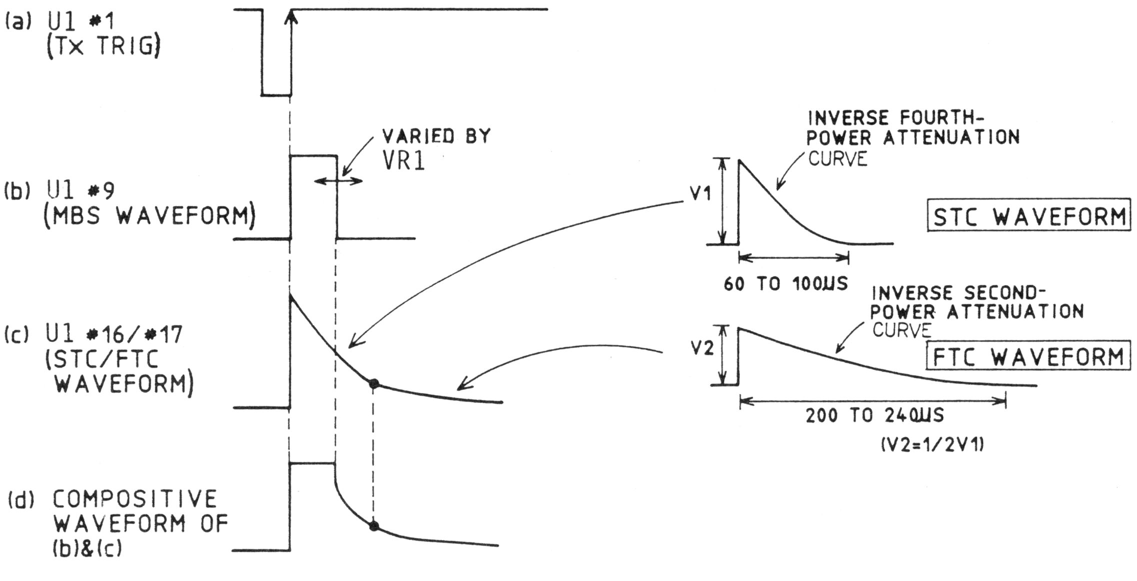

(a) U1 #1
(Tx TRIG)
VARIED BY
VR1
(b) U1 #9
(MBS WAVEFORM)
(c) U1 #16/#17
(STC/FTC
WAVEFORM)
(d) COMPOSITIVE
WAVEFORM OF
(b)&(c)
INVERSE FOURTH-
POWER ATTENUATION
CURVE
V1
STC WAVEFORM
60 TO 100μS
INVERSE SECOND-
POWER ATTENUATION
CURVE
V2
FTC WAVEFORM
200 TO 240μS
(V2=1/2V1)

Fig.1-12

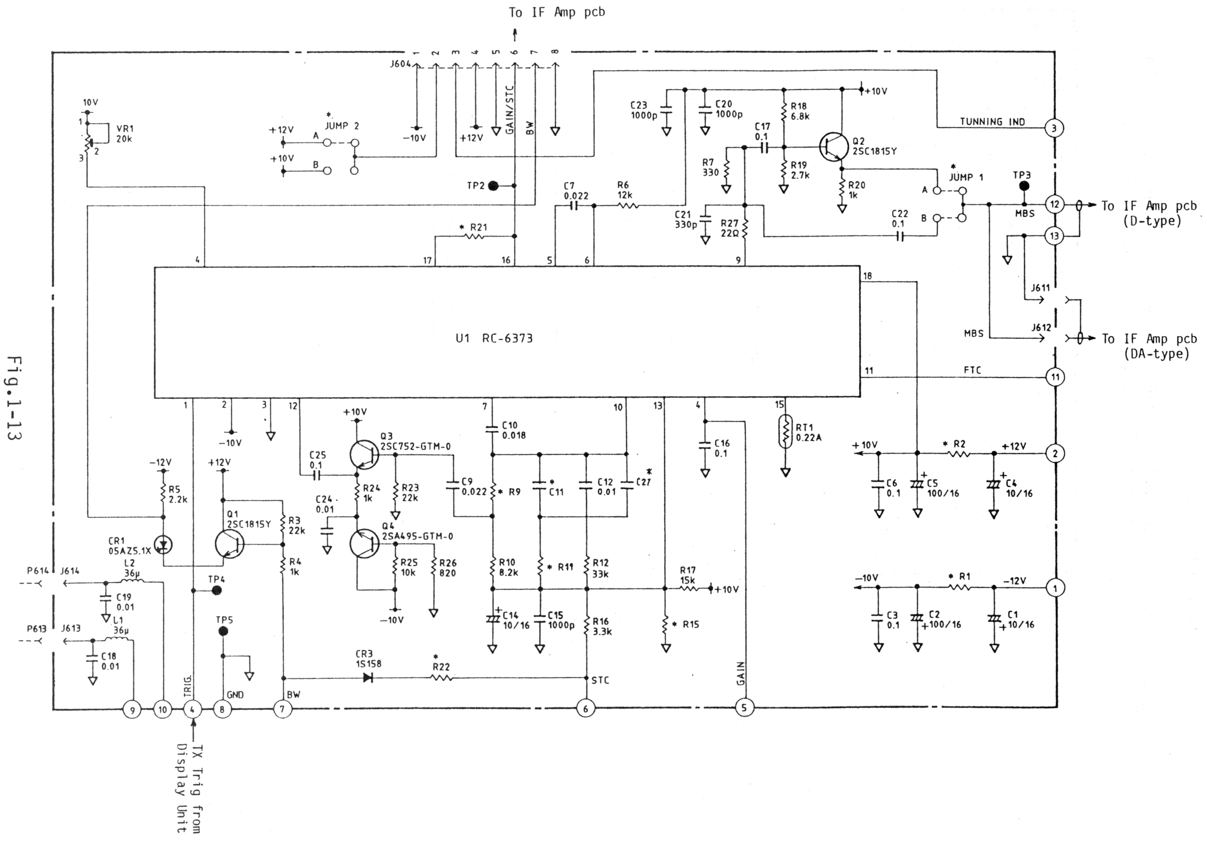

To IF Amp pcb
J604
GAIN/STC
BW
10V
VR1
20k
JUMP 2
+12V
+10V
A
B
-10V
+12V
TP2
C23
1000p
C20
1000p
R18
6.8k
+10V
C17
0.1
Q2
2SC1815Y
R7
330
R19
2.7k
R20
1k
JUMP 1
TP3
TUNNING IND
C7
0.022
R6
12k
C21
330p
R27
22Ω
C22
0.1
MBS
To IF Amp pcb
(D-type)
R21
J611
J612
MBS
To IF Amp pcb
(DA-type)
U1 RC-6373
FTC
-10V
+10V
Q3
2SC752-GTM-0
C10
0.018
C16
0.1
RT1
0.22A
R2
+12V
C25
0.1
R24
1k
R23
22k
C9
0.022
R9
C11
C12
0.01
C27
C6
0.1
C5
100/16
C4
10/16
-12V
R5
2.2k
+12V
Q1
2SC1815Y
R3
22k
C24
0.01
Q4
2SA495-GTM-0
CR1
05AZ5.1X
L2
36μ
R4
1k
R25
10k
R26
820
R10
8.2k
R11
R12
33k
R17
15k
+10V
-10V
R1
-12V
P614
J614
TP4
C19
0.01
L1
36μ
P613
J613
TP5
C18
0.01
C14
10/16
C15
1000p
R16
3.3k
R15
C3
0.1
C2
100/16
C1
10/16
CR3
1S158
R22
STC
GAIN
TRIG.
GND
BW
TX Trig from
Display Unit

Fig.1-13

1-6. Bearing Signal Generator

The bearing signal generator produces the square wave signal that synchronizes the sweep rotation with the antenna rotation.

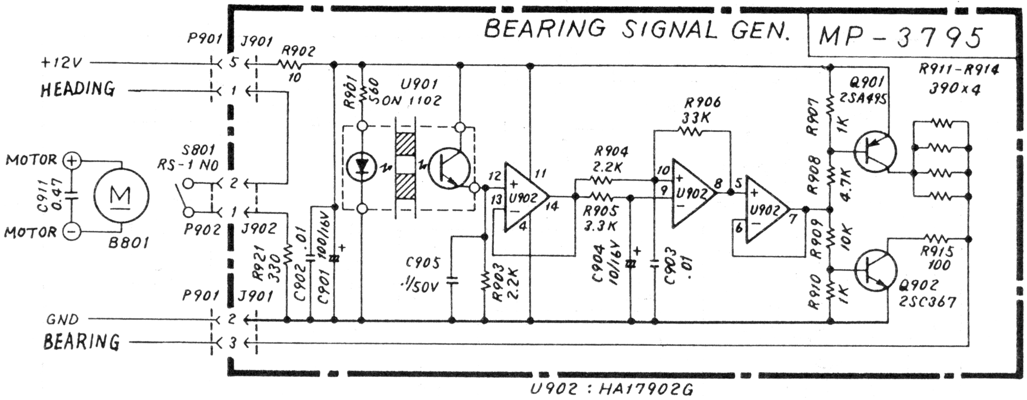

BEARING SIGNAL GEN.
MP-3795
P901
J901
R902
10
+12V
HEADING
5
1
R901
560
U901
ON 1102
R906
33K
R907
1K
Q901
2SA495
R911-R914
390x4
S801
RS-1 NO
MOTOR ⊕
MOTOR ⊖
C911
0.47
M
B801
P902
J902
2
1
R904
2.2K
R905
3.3K
12
13
11
14
4
U902
10
9
8
5
6
7
R908
4.7K
R909
10K
R910
1K
R921
330
C902
.01
C901
100/16V
C905
.1/50V
R903
2.2K
C904
10/16V
C903
.01
R915
100
Q902
2SC367
P901
J901
GND
BEARING
2
3
U902 : HA17902G

Fig.1-14

U901 is the photo-interrupter composed of a light emitting diode and a photo transistor. It has a configuration in the shape of "U". The light emitting diode is mounted in one wall of "U" shape and the photo transistor in the other wall. There is a slit between the walls, where the timing disc rotates.

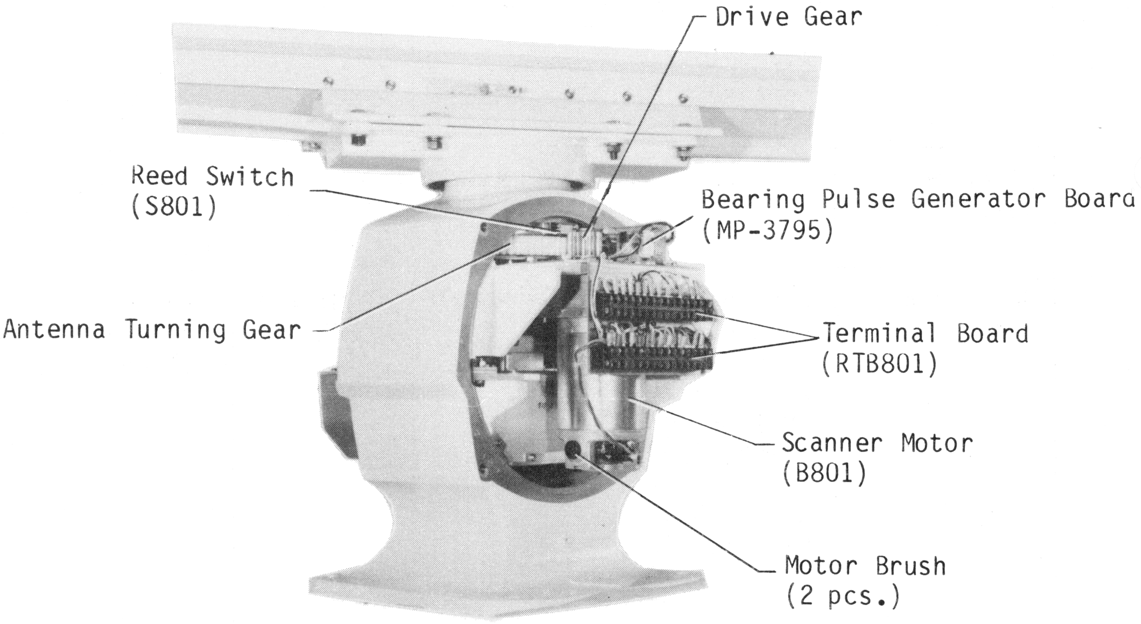
60 slits are arranged along the circumference of the timing disc at regular intervals. The timing disc is fitted on the scanner motor shaft and rotates at speed of 144rpm.

The photo transistor receives light emitted by the light emitting diode thru the slit of the timing disc and converts it into electric current. The output of the photo transistor across R903 represents the half-rectified sine wave with frequency of 144Hz. This signal is amplified, reshaped and then sent to the display unit as the bearing signal.

CHAPTER 2. ADJUSTMENT

Item	Ratings	Measurement	
		Check Point	Adjuster & Condition
Magnetron Heater Volt.	7.0 to 7.6V (FR-1505/1510)	RF Module ⊕ P801 #12 ⊖ P801 #11	Set to 0.25nm range, ST-BY and adjust R812 on RF module.
	7.2 to 7.7V (FR-1525; "SP")		
	5.5 to 5.7V (FR-1525; "M1P", "M2P", "LP")		Transmit on 48nm range and adjust R811 on RF module.
Diode Monitor Volt.	1.4 to 4.2V	RF Module ⊕ P601 #2 ⊖ P601 #10	Set to 0.25 nm range, ST-BY and confirm DI monitor voltage.
Magnetron Current	1.8 to 4.0V (FR-1505; "SP")	RF Module ⊕ P801 #13 ⊖ P801 #5	Transmit on each range and confirm each voltage.
	2.0 to 4.0V (FR-1505; "M1P", "M2P", "LP")		
	2.5 to 5.0V (FR-1510; "SP")		
	3.0 to 5.0V (FR-1510; "M1P", "M2P", "LP")		
	5.0 to 7.0V (FR-1525; "SP")		
	6.0 to 8.0V (FR-1525; "M1P", "M2P", "LP")		
Main Bang Suppression	Approx. ϕ0.014nm black hole should appear at center screen.	CRT	Transmit on 0.25nm and adjust VR1 on STC pcb.

CHAPTER 3 PARTS LOCATION


Drive Gear
Reed Switch
(S801)
Bearing Pulse Generator Board
(MP-3795)
Antenna Turning Gear
Terminal Board
(RTB801)
Scanner Motor
(B801)
Motor Brush
(2 pcs.)

N Photo No. 639

Fig. 3-1 Scanner Unit with Scanner Housing Cover removed

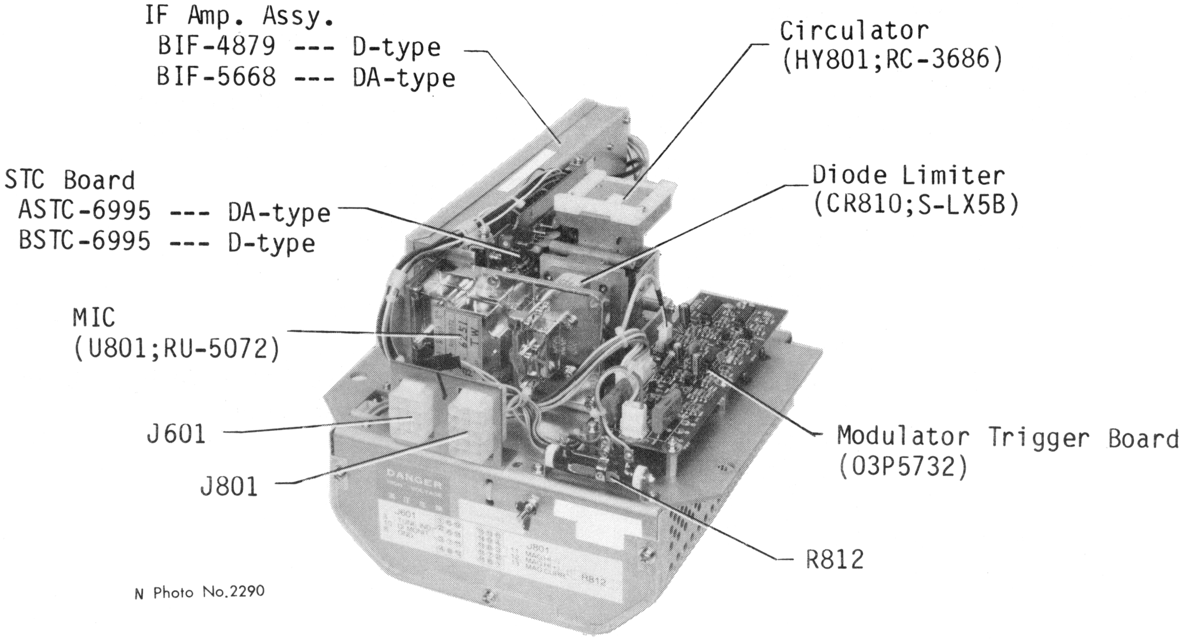

IF Amp. Assy.
BIF-4879 --- D-type
BIF-5668 --- DA-type
Circulator
(HY801;RC-3686)
STC Board
ASTC-6995 --- DA-type
BSTC-6995 --- D-type
Diode Limiter
(CR810;S-LX5B)
MIC
(U801;RU-5072)
J601
J801
Modulator Trigger Board
(03P5732)
R812
N Photo No.2290
DANGER

Fig. 3-2 Transceiver Module for FR-1505/1510D(A)

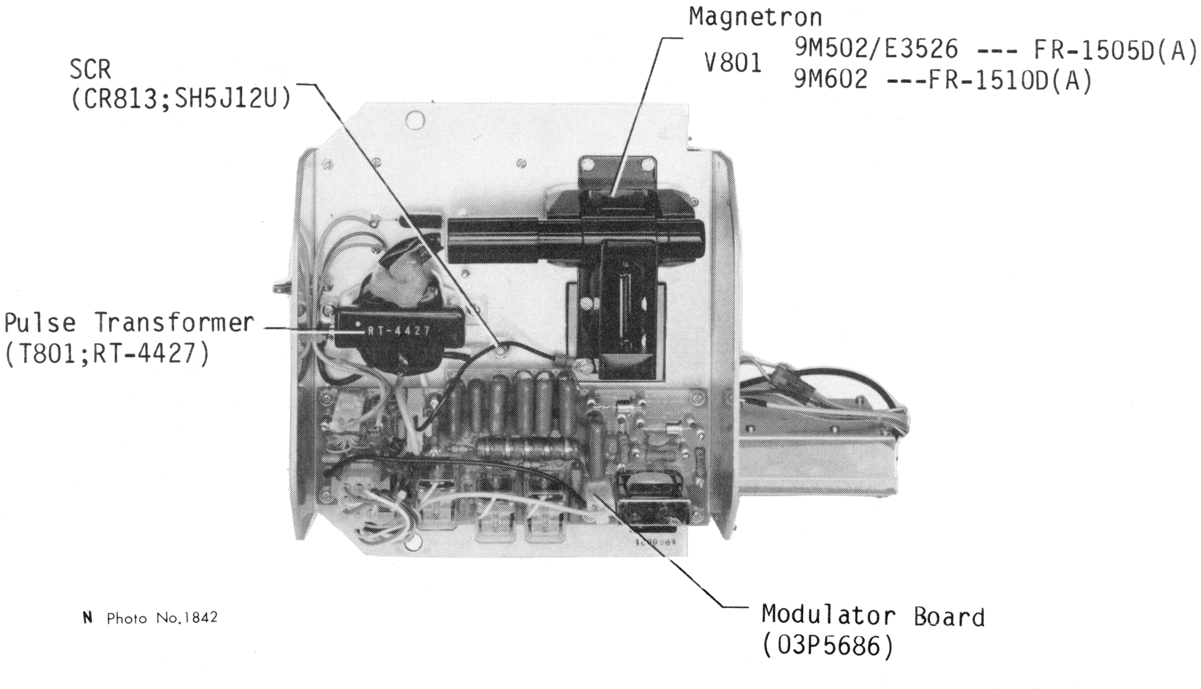

Magnetron
V801
9M502/E3526 --- FR-1505D(A)
9M602 ---FR-1510D(A)
SCR
(CR813;SH5J12U)
Pulse Transformer
(T801;RT-4427)
RT-4427
Modulator Board
(03P5686)
N Photo No.1842

Fig. 3-3 Transceiver Module Bottom View with Shield Cover removed
(for FR-1505/1510D(A))

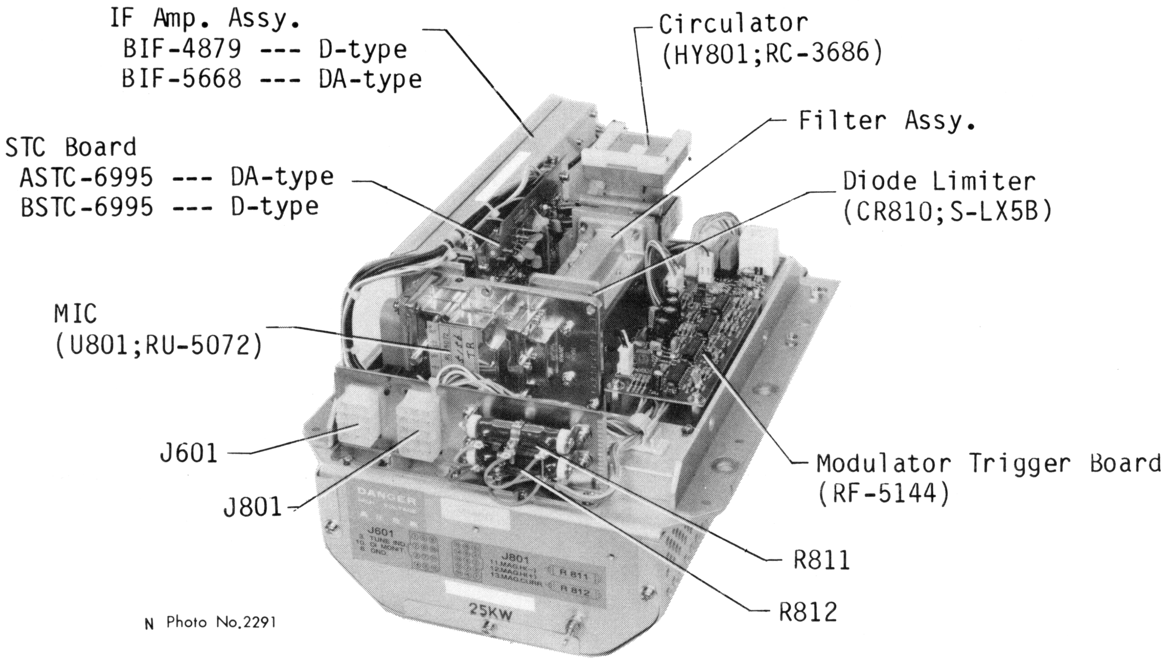

IF Amp. Assy.
BIF-4879 --- D-type
BIF-5668 --- DA-type
Circulator
(HY801;RC-3686)
Filter Assy.
STC Board
ASTC-6995 --- DA-type
BSTC-6995 --- D-type
Diode Limiter
(CR810;S-LX5B)
MIC
(U801;RU-5072)
J601
J801
Modulator Trigger Board
(RF-5144)
R811
R812
25KW
N Photo No.2291

Fig. 3-4 Transceiver Module for FR-1525D(A)

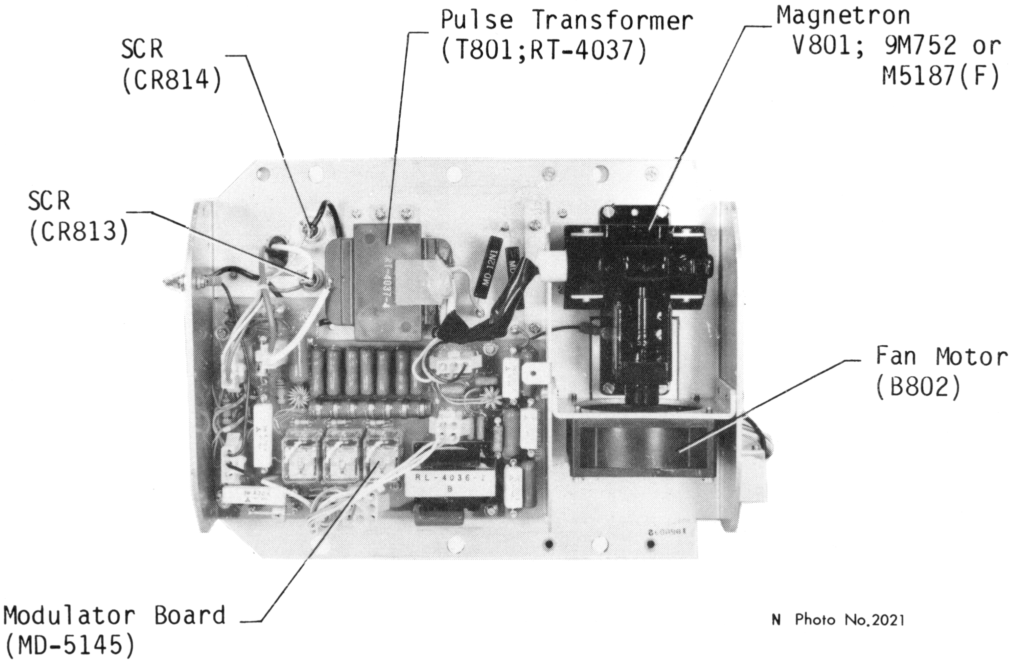

SCR
(CR814)
Pulse Transformer
(T801;RT-4037)
Magnetron
V801; 9M752 or
M5187(F)
SCR
(CR813)
Fan Motor
(B802)
Modulator Board
(MD-5145)
N Photo No.2021

Fig. 3-5 Transceiver Module Bottom View with Shield Cover removed
(for FR-1525D(A))

PART 3

MAINTENANCE, REPLACEMENT & TROUBLESHOOTING

CONTENTS

* * * * * *

Page

CHAPTER 1. MAINTENANCE & REPLACEMENT OF MAJOR COMPONENTS 1-1 to 1-15

1-1. General 1-1
1-2. Cleaning and Lubrication 1-1
1-3. Replacement of Major Compoments in Display Unit 1-5
1-4. Removal and Replacement of Major Components in Scanner Unit 1-10

CHAPTER 2. TROUBLESHOOTING 2-1 to 2-3

CHAPTER 1 MAINTENANCE & REPLACEMENT OF MAJOR COMPONANTS

1.1 General

The radar system should maintain optimum performance for a reasonably long period of time. Factory adjustment or alignment of circuits does not require frequent readjustments and realignments. However, continued performance can not be expected without periodic inspection and maintenance.

Periodically, a thorough inspection of the equipment should be made. Cable connections at terminal boards and connectors should be kept clean and tight. Be sure all ground connections are secure and properly grounded. Arrange all wires and cables in orderly manner to prevent the possibility of arc-over or short. Replace all wires that show signs of corrosion, cracking or deterioration.

All units of the equipment should be kept clean and free from corrosion. Replace all missing knobs and defective or broken parts. Housing, shields, covers and other protective devices should be at their proper place and secured.

1.2 Cleaning and Lubrication

Cleaning lengthens the operating life of the equipment. Dirt on components can result in shortcircuits. A dry, soft cloth and soft bristled brush are recommended for removing dirt from the outside of the unit. Dirt on the inside of the unit should be removed with a soft-bristled brush and removed by using an electric cleaner.

Hardened dirt should be removed by using a mild detergent and water solution on a cotton-tipped swab or a soft cloth. Avoid excessive use of water. Do not allow water to penetrate any parts. Avoid the use of abrasives and chemical agents.

Corroded areas should be cleaned with a neutralizing solution of 2% borax and water to prevent further corrosion.

CAUTION:

After cleaning, the sets should be carefully inspected for defects such as poor connections, damaged parts and loosened mechanical parts.

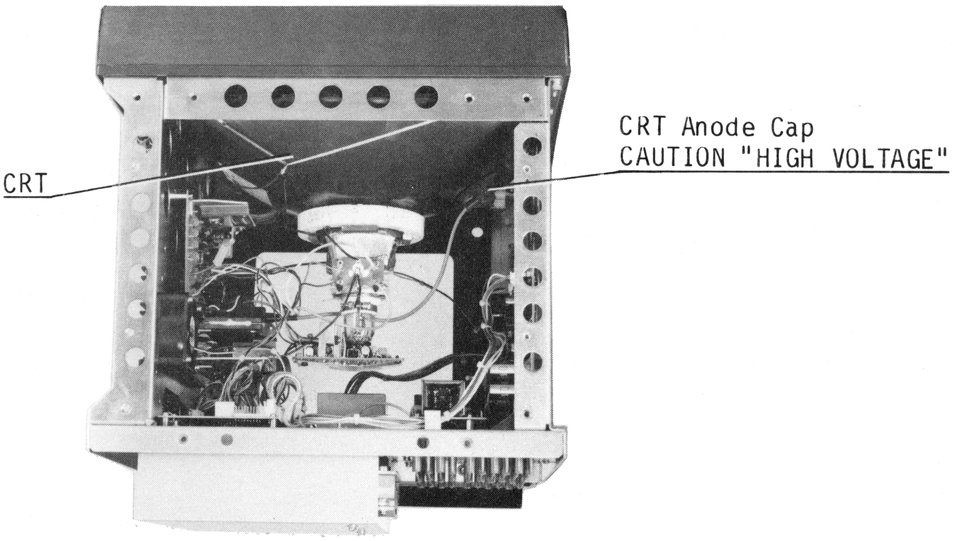
Keep all moving parts properly lubricated using a cleaning-type lubricant on shaft bushings. Do not overlubricate.

Lubricate ball bearing, turning shafts and screw threads with a slight amount of grease. Do not overlubricate.

Interval	Item	Check/Measures	Remarks
3 to 6 months	Exposed bolts and nuts on scanner unit	Check for corroded or loosened bolts/nuts. If necessary, clean them up and repaint thickly. Replace them with new ones if heavily corroded.	*Sealing compound may be used instead of paint. *Put slight amount of grease if bolts and nuts are replaced.
	Scanner radiator	Check for dirt or crack on the radiator surface. Thick dirt should be wiped off by using a soft cloth immersed in fresh water. If any crack is found, apply slight amount of sealing compound or adhesive as first-aid treatment, then call for repair.	*Do not use plastic solvent (thinners or acetone) for cleaning. *When removing ice on the scanner unit, use wooden hammer or plastic-head hammer. Crack on the scanner unit will cause permanent damage to the internal circuitry due to water leakage.
	Terminal boards and plugs in scanner unit	Remove scanner covers (or open scanner cover) to check terminal board/plug connections inside. Also check if the O-ring or gasket for the cover is in good order.	*When putting cover(s) back in position, do not pinch flying wires.
	CRT screen	Dirt on this creates symptom identical to poor sensitivity. Clean up CRT surface using special care not to scratch them.	*Use soft cloth with slight amount of anti-static-charge spray. Never apply plastic solvent.
6 months to 1 year	Scanner motor	Check and clean up carbon brushes and commutator. If brushes have worn out to 6mm or less, replace them with new ones. (New brush is 11mm long.)	*Under normal use, the carbon brush will last approximately 2000 hours.

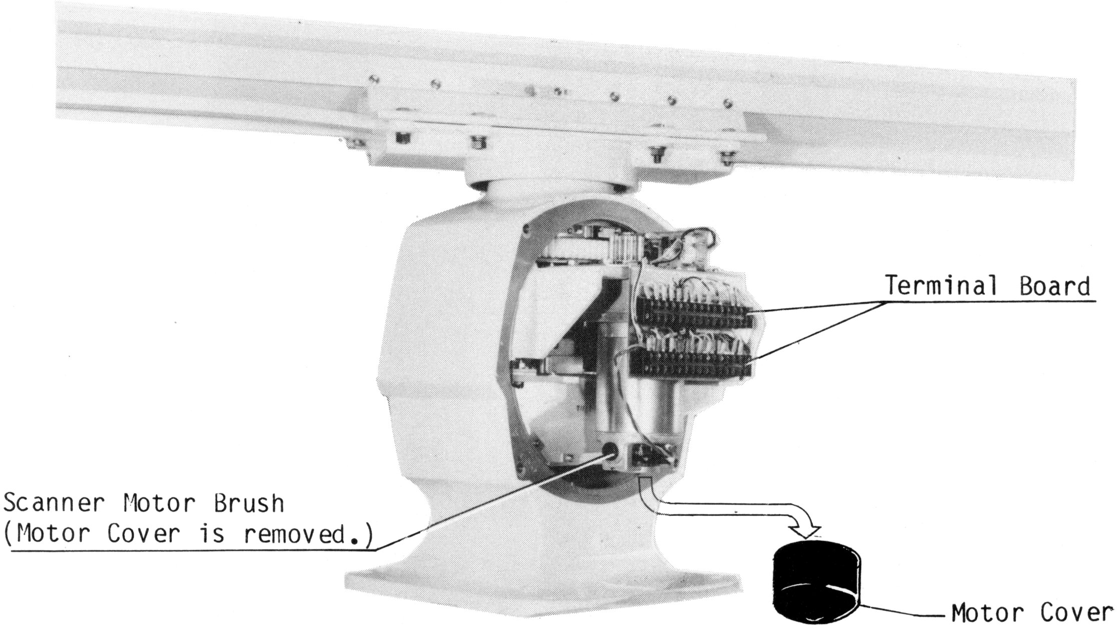
Continued

Interval	Item	Check/Measures	Remarks
6 months to 1 year	CRT anode and approach	High tension on CRT attracts dust in environment, and moist dust will cause poor insulation. Clean up high voltage parts as follows. 1. Turn off radar. 2. Pull out anode cap and touch its nipple to chassis (discharging). 3. Clean up CRT side and anode cap/lead by using soft dry cloth.	*If any crack is found on rubber cap or wire sheath, replace it with new one. *Always make sure to put anode cap back on CRT after cleaning.
	Terminal boards, sockets and plugs	Check for loose connections. Polish up contacts or replace plug, if necessary.	


CRT
CRT Anode Cap
CAUTION "HIGH VOLTAGE"

N Photo No.2248

Fig. 1-1 **Display Unit**


Terminal Board
Scanner Motor Brush
(Motor Cover is removed.)
Motor Cover

N Photo No. 639

Fig. 1-2 **Scanner Unit**

1.3 Replacement of Major Components in Display Unit

Power Supply Module (included Power Supply board (PTU6982))

1) Remove the Top Cover by loosening the six M4x10 cosmetic screws.
2) Disconnect the connectors (P401, P402, P403, P404 and P405) on the Power Supply board (PTU6982).
3) Disconnect the connector P441 on the TX HV board (A or B HV-7130).
4) Remove the Power Supply Module by loosening the six M4x12 screws and the five M3x8 screws.

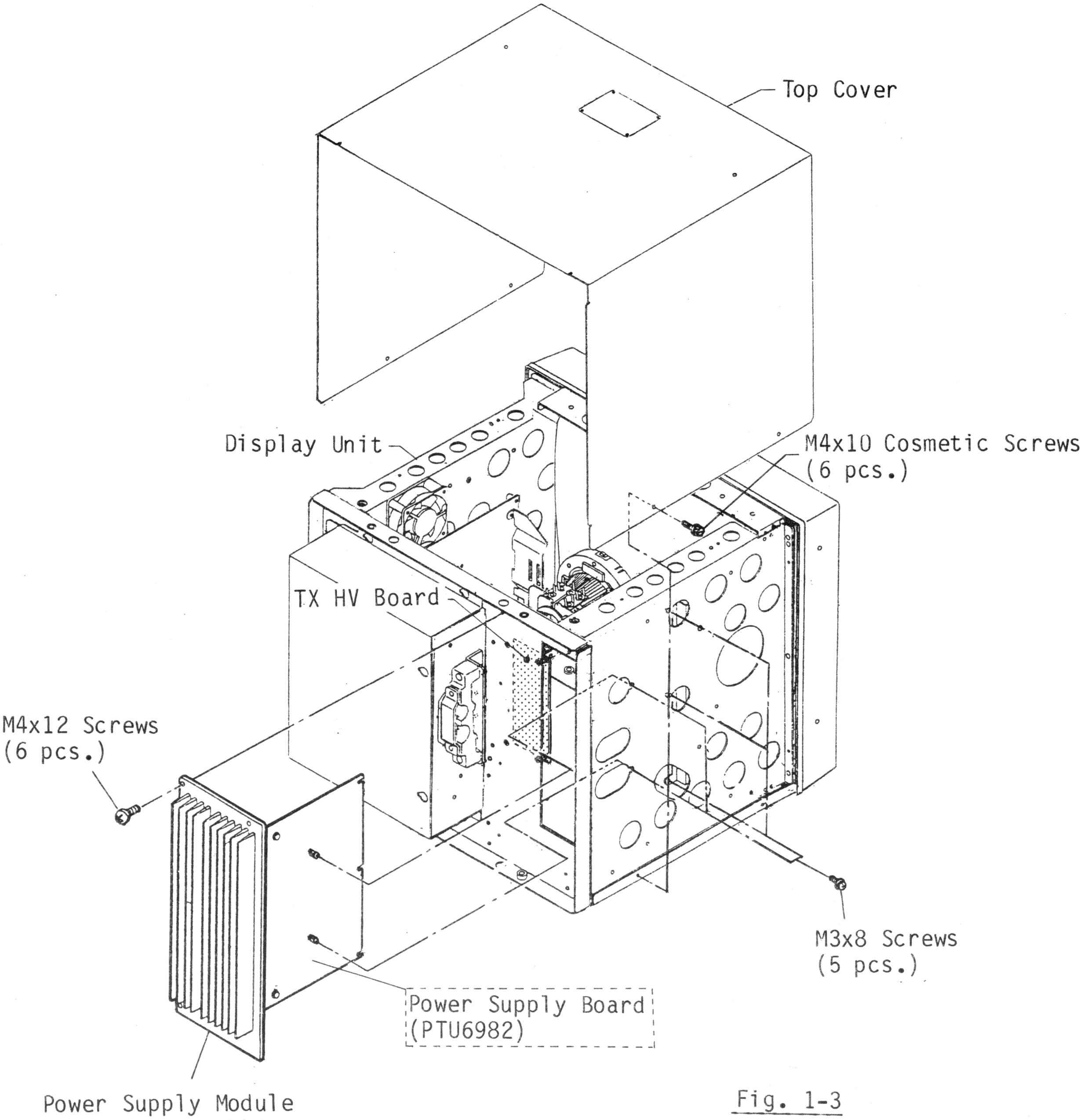

Top Cover
Display Unit
M4x10 Cosmetic Screws (6 pcs.)
TX HV Board
M4x12 Screws (6 pcs.)
M3x8 Screws (5 pcs.)
Power Supply Board (PTU6982)
Power Supply Module

Fig. 1-3

Processor Board (03P6977)

1) Remove the Top Cover by loosening the six M4x10 cosmetic screws.

2) Disconnect the connector (P103, P104, P105, P106, P107, P108 and P109) on the Processor board (03P6977).

3) Remove the Processor board by loosening the nine M3x8 screws.

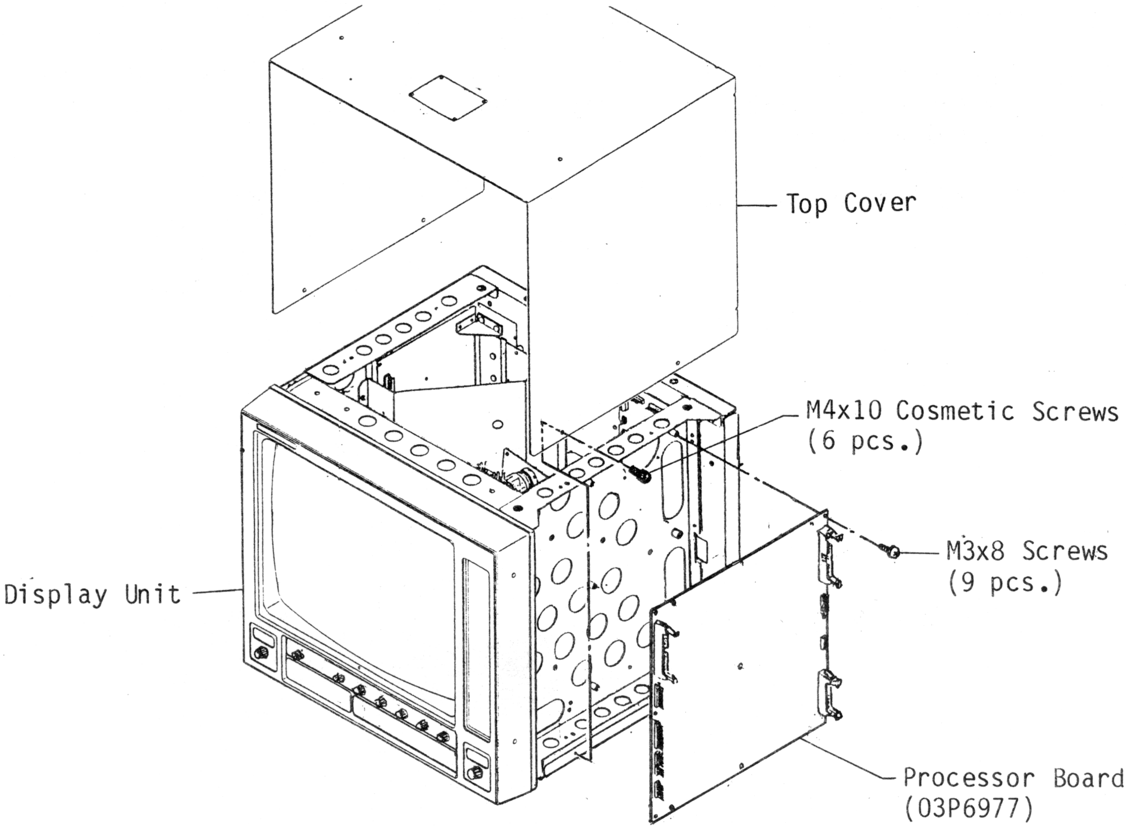


Fig. 1-4

Panel Board Assy. (03P6978)/Encoder Boards(03P6981/VRM,EBL)/ Keyboard /Illumination Board (03P6979)
(Refer to Fig. 1-5.)

1) Remove the Top Cover by loosening the six M4x10 cosmetic screws.

2) Remove the Front Panel Assy. by loosening the five M5x12 screws. (A hex. wrench is necessary for this removal.)

3) Separate the Front Panel Assy. from Display main chassis by disconnecting the connectors P201 and P202 on the Illumination board (03P6979), P301, P306 and P307 on the Panel board (03P6978), P502 on the EBL-Encoder board (03P6981) and P502 on the VRM-Encoder board (03P6981). (Write "EBL" or "VRM" on both P502 connectors by maker to distinguish the both connector.)

4) Remove the eight Knobs and one Arrow Knob as shown in Fig. 1-5.

5) Remove the Panel board Assy. (03P6978) by loosening the four M3x8 screws and disconnecting the connectors P302, P303, P304 and P305.

6) Remove the EBL-Encoder board (03P6981) by loosening the three M3x8 screws and disconnecting the connector P501.

7) Remove the VRM-Encoder board (03P6981) by loosening the three M3x8 screws and disconnecting the connector P503.

8) Remove the Illumination board (03P6979) by loosening the four 2.6x5 screws and disconnecting the two flat wires come from the Keyboard and the connector P205.

9) Remove the Keyboard by loosening the four M3x8 screws.

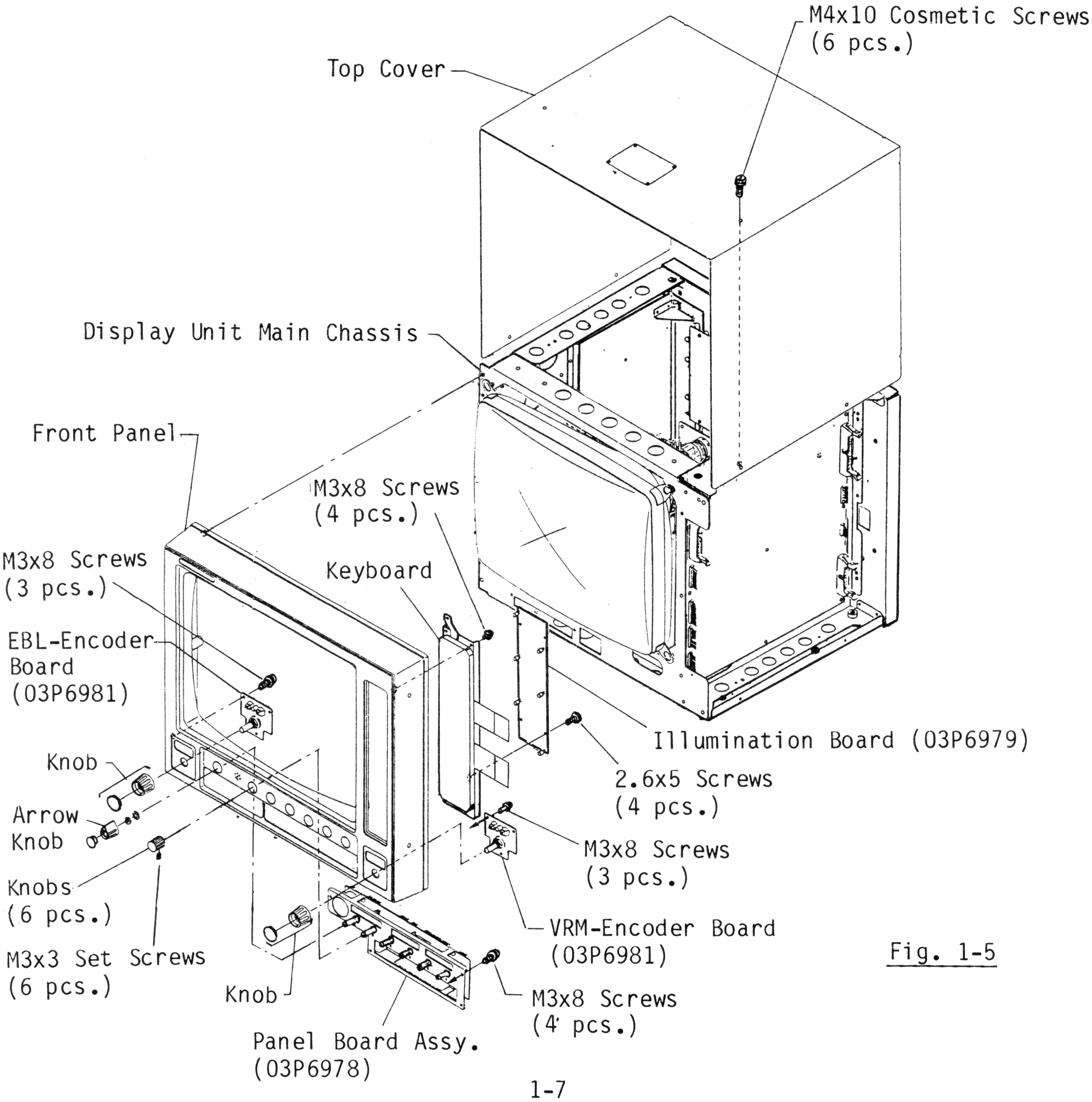

M4x10 Cosmetic Screws (6 pcs.)
Top Cover
Display Unit Main Chassis
Front Panel
M3x8 Screws (4 pcs.)
M3x8 Screws (3 pcs.)
Keyboard
EBL-Encoder Board (03P6981)
Illumination Board (03P6979)
Knob
2.6x5 Screws (4 pcs.)
Arrow Knob
M3x8 Screws (3 pcs.)
Knobs (6 pcs.)
VRM-Encoder Board (03P6981)
M3x3 Set Screws (6 pcs.)
Knob
M3x8 Screws (4 pcs.)
Panel Board Assy. (03P6978)

Fig. 1-5

Deflection Board/ CRT Board/CRT Assy.

1) Separate the Display Unit from the Mounting Saddle by loosening the two M8x35 Bolts.

2) Remove the Top Cover by loosening the six M4x10 cosmetic screws.

3) Remove the Bottom plate by loosening the eight M6x16 bolts.

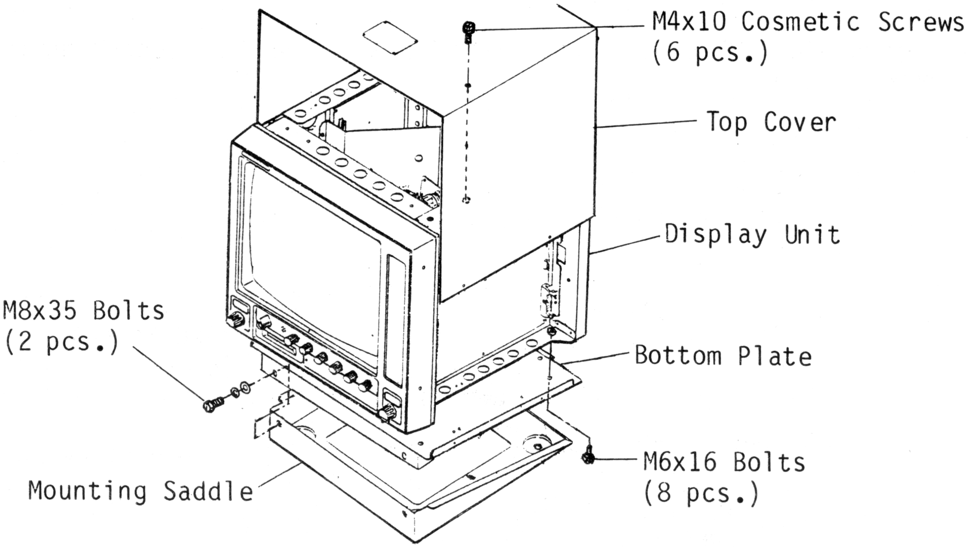

M4x10 Cosmetic Screws
(6 pcs.)
Top Cover
Display Unit
M8x35 Bolts
(2 pcs.)
Bottom Plate
M6x16 Bolts
(8 pcs.)
Mounting Saddle

Fig. 1-6

4) Remove the Front Panel Assy. referring to step 3 on page 1-6.

5) To discharge high voltage on the Anode cap, connect between the Anode cap and Display Chassis by handling the two screw drivers. Refer to Fig. 1-7.

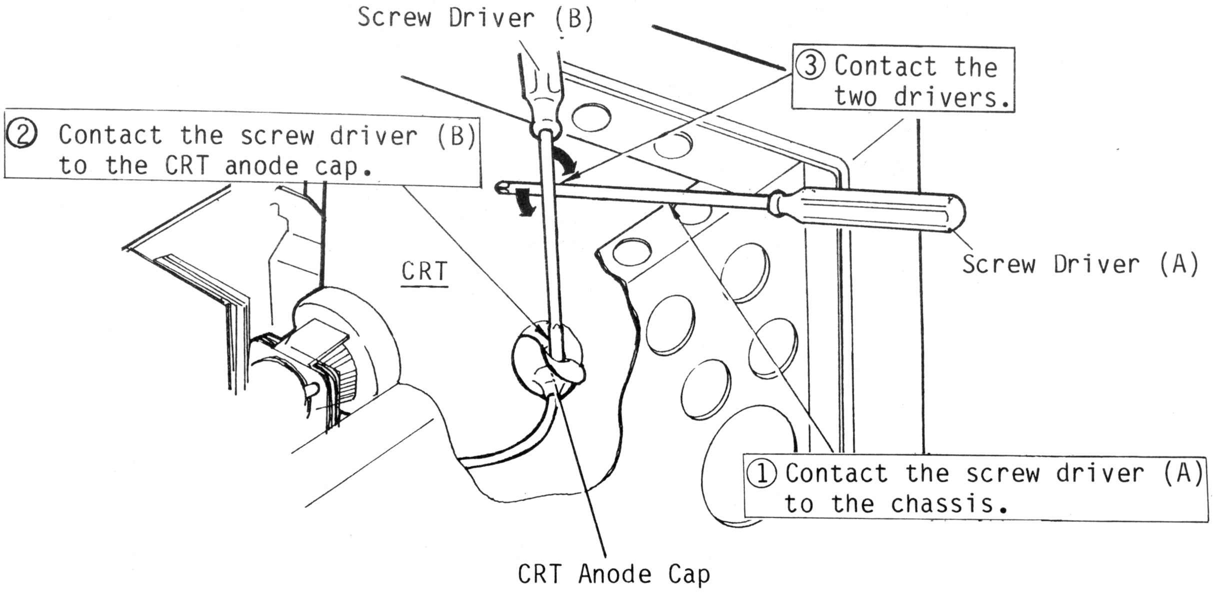

Screw Driver (B)
③ Contact the two drivers.
② Contact the screw driver (B) to the CRT anode cap.
CRT
Screw Driver (A)
① Contact the screw driver (A) to the chassis.
CRT Anode Cap

Fig. 1-7

6) Disconnect the two connectors come from Power Supply board (PTU6982) and Interface board (03P6980).

7) Disconnect the wires and connectors connected to the CRT.

8) Pull out the CRT socket on the CRT board.

9) Remove the CRT Assy. by loosening the four M5x12 screws.

10) Remove the Deflection board with the CRT board by loosening the six M3x8 screws.

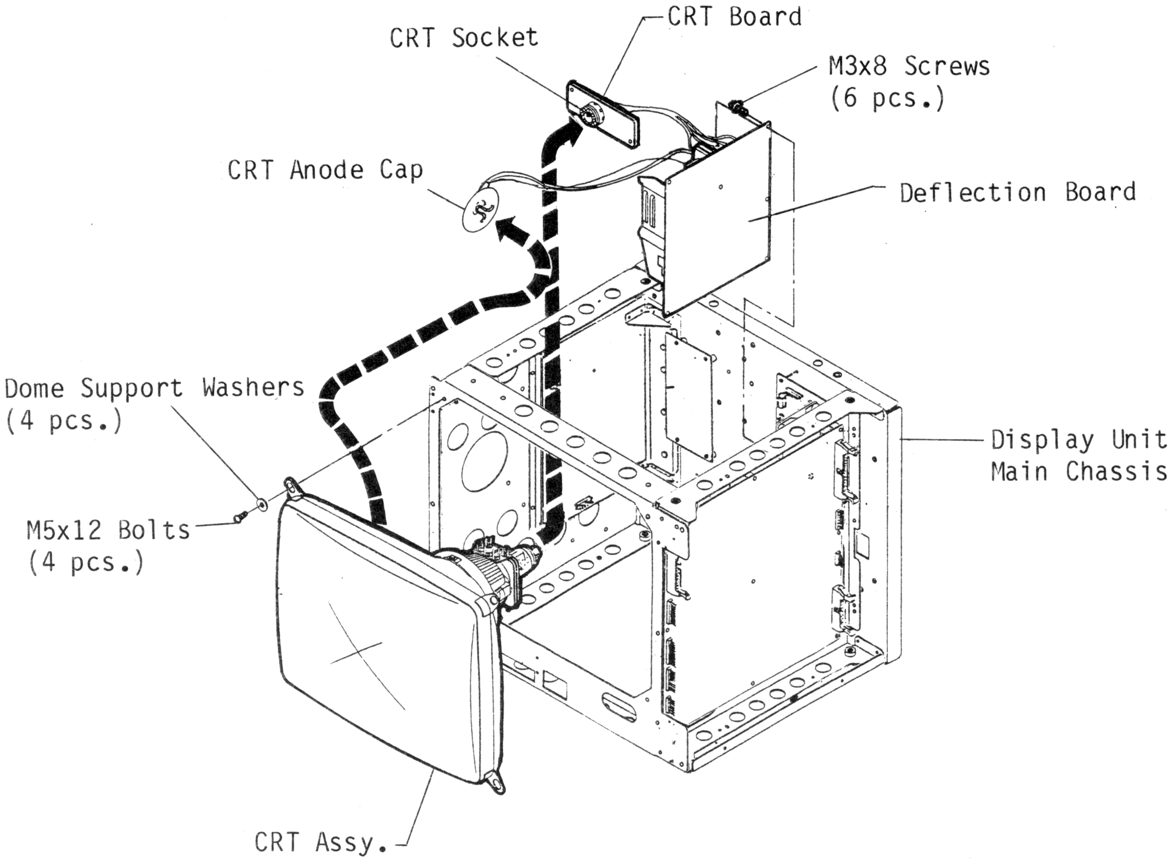

CRT Socket
CRT Board
M3x8 Screws
(6 pcs.)
CRT Anode Cap
Deflection Board
Dome Support Washers
(4 pcs.)
Display Unit
Main Chassis
M5x12 Bolts
(4 pcs.)
CRT Assy.

Fig. 1-8

1.4 Removal and Replacement of Major Components in Scanner Unit

Transceiver Module

When checking or replacement of components in the transceiver module is required, take out the transceiver module from the scanner housing in the following steps.

1) Switch off the radar.

2) Open the stern side scanner housing cover by loosening four bolts.

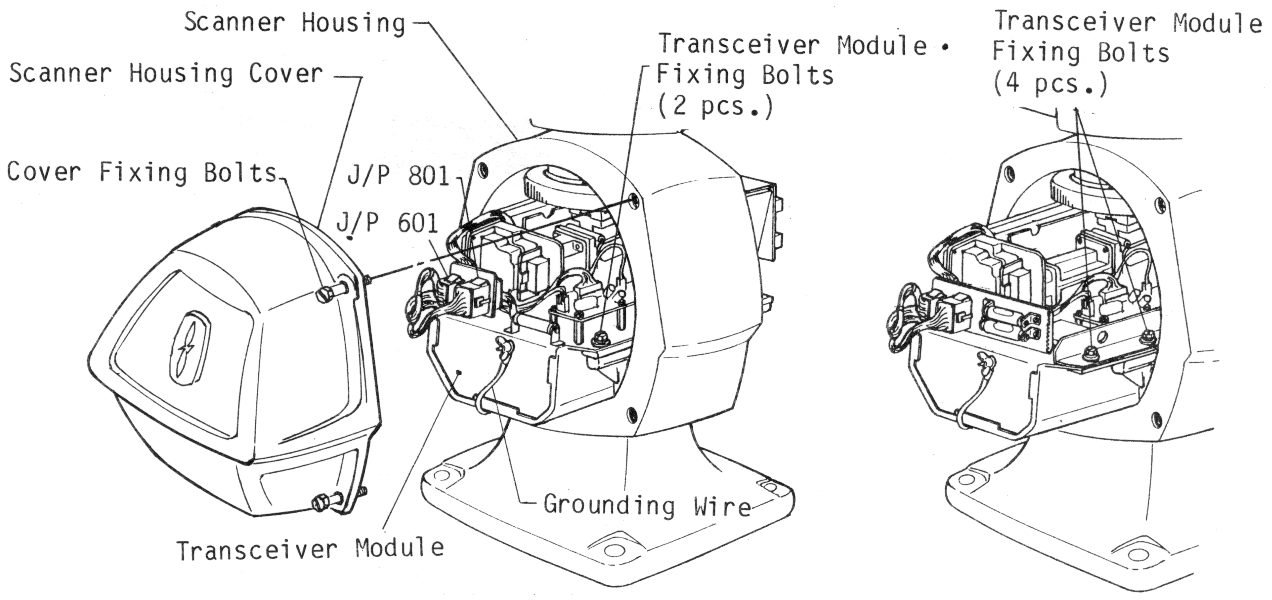
3) Loosen two M8x25 bolts (for FR-1505/1510D(A)) or four M8x25 bolts (for FR-1525D(A)) securing the transceiver module to the chassis. See Fig. 1-9.

4) Disconnect two multi-connectors P601 and P801.

5) Loosen the wing nut and remove the grounding wire (inner shield of multicore cable).

6) Take out the transceiver module.

NOTE: To prevent demagnetization of magnetron, the transceiver module should not be placed in a proximity of ferro-magnetic materials and stray magnetic field. If working desk is made of steel, place the module upside-down.


Scanner Housing
Scanner Housing Cover
Cover Fixing Bolts
J/P 801
J/P 601
Transceiver Module Fixing Bolts (2 pcs.)
Transceiver Module Fixing Bolts (4 pcs.)
Grounding Wire
Transceiver Module

(a) Scanner Unit for FR-1505/1510D(A)   (b) Scanner Unit for FR-1525D(A)

Fig. 1-9

Magnetron

1) Make sure the radar system is turned off.

2) Take out the transceiver module in the way mentioned on page 1-10.

3) Remove the shield cover by loosening six fixing screws.

4) Unsolder two magnetron heater lead wires from the pulse transformer.

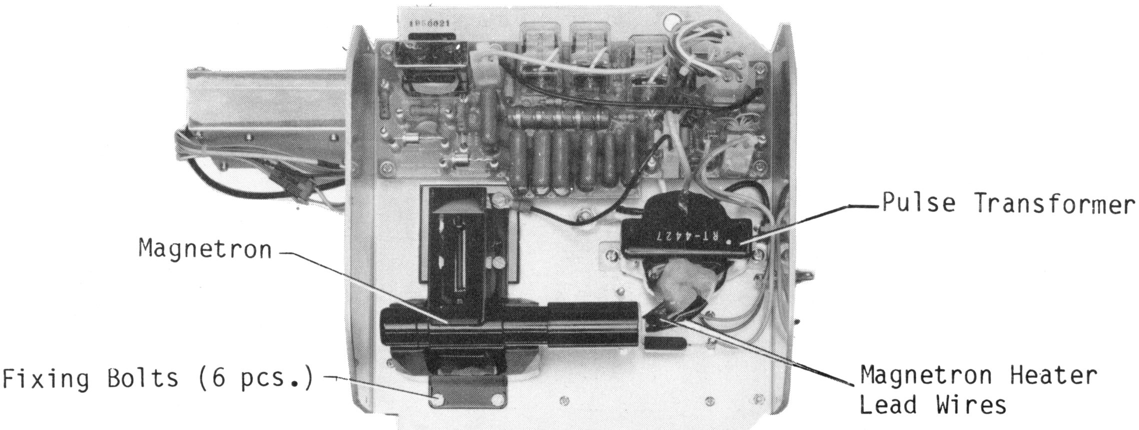
5) Using a non-magnetic screwdriver, remove six fixing bolts securing the magnetron to the module and carefully lift out the magnetron.

CAUTION: As the magnetron has a strong magnetic force, the wrist watch should be removed while replacing the magnetron to preserve the watch from damage.

In the case of FR-1505/1510D(A) type radar, the heater voltage must always be kept between 7.0 and 7.6VDC. For FR-1525D(A) type radar, the heater voltage must be kept 7.2 and 7.7VDC in short range, between 5.5 and 5.7VDC in middle or long range. The higher voltage shortens the life of the magnetron.

When a new magnetron is fitted, allow at least 15 to 20 minute pre-heating under ST-BY, and depress the **ST-BY/TX touchpad** about 10 times.

The magnetron must not be stored in a proximity of ferro-magnetic materials and magnetic field to prevent deterioration due to demagnetization.



N Photo No.1842

lead wire	-- terminal of the pulse transformer
yellow	-- (#6)
green	-- (#4)

Fig. 1-10 Transceiver Module Bottom View with Shield Cover removed

IF Amp. Case/STC Board/MIC/Limiter

1) Loosen two M4x8 screws securing the STC board to the IF amp. case. See Fig. 1-11.

2) Loosen three M4x8 screws securing the IF amp. case and two M4x10 screws securing the MIC to the chassis, lifting up the STC board.

3) Loosen four M4x10 screws shown in Fig. 1-11 securing the limiter with Filter to the circulator.

4) Disconnect J601, and the IF Amp. Case/STC Board/MIC/Limiter assembly comes free.

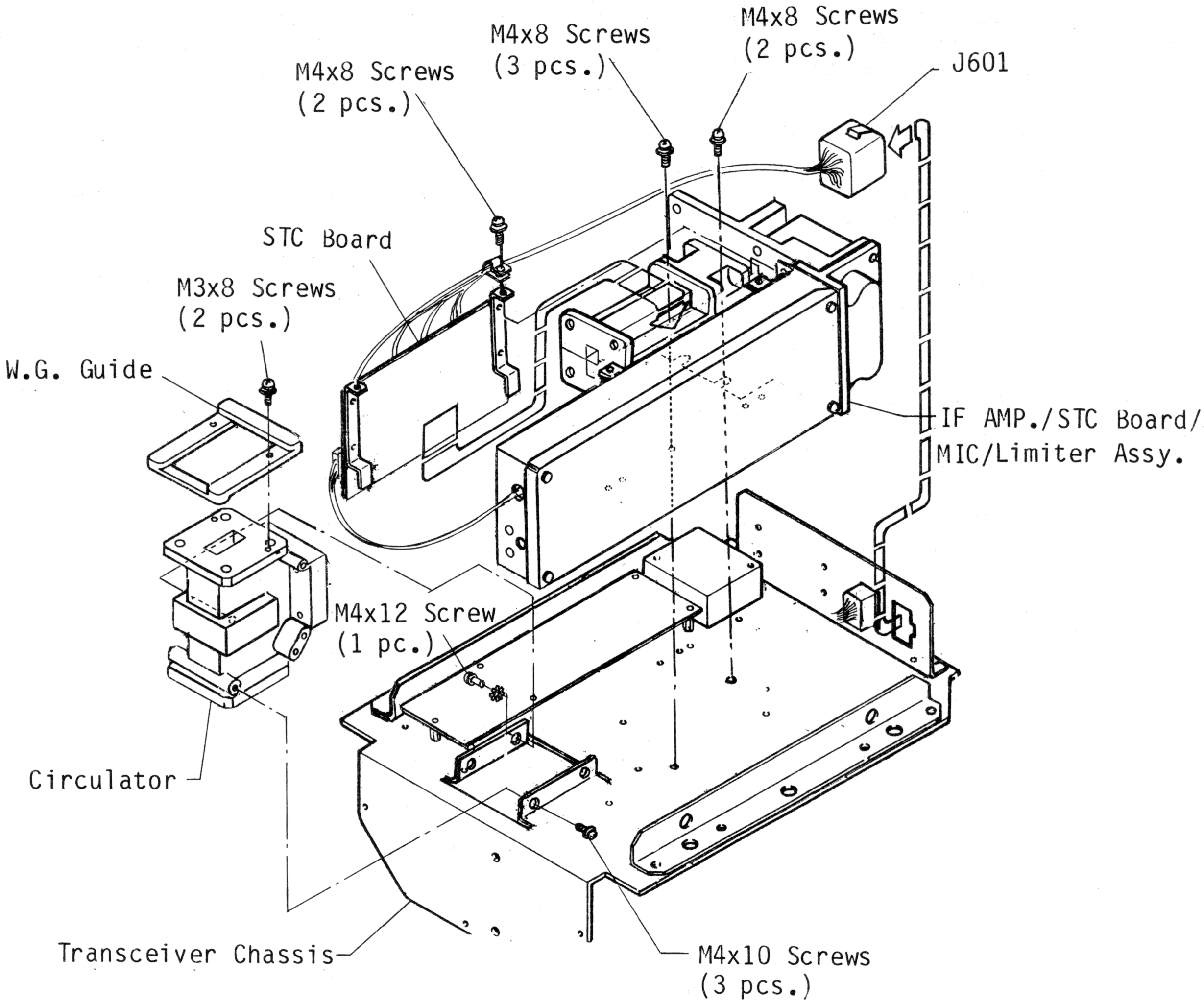

M4x8 Screws (2 pcs.)
M4x8 Screws (3 pcs.)
M4x8 Screws (2 pcs.)
J601
STC Board
M3x8 Screws (2 pcs.)
W.G. Guide
IF AMP./STC Board/ MIC/Limiter Assy.
M4x12 Screw (1 pc.)
Circulator
Transceiver Chassis
M4x10 Screws (3 pcs.)

Fig. 1-11

Circulator

1) Take out the IF Amp. Case/STC Board/MIC/Limiter assembly as mentioned above.

2) Loosen four fixing screws securing the magnetron to the circulator.

3) Detach the circulator from the chassis by loosening four fixing nuts. See Fig. 1-11.

4) Separate the W.G. Guide from the Circurator by loosening the two M3x8 screws.

MIC Assy./Limiter/Filter Wave Guide

(This replacement must be done inside a building shore to protect the MIC from exposure to radar waves transmitted by other ships.)

A. FR-1505/1510D(A)

1) Take out the IF Amp. Case/STC Board/MIC/Limiter assembly in the way mentioned above.

2) Remove the IF amp. case cover by loosening four M3x8 screws and disconnect P605 (or P608) from the IF AMP board.

3) Separate the MIC with limiter from the IF amp. case by loosening four M4x12 screws shown in Fig. 1-12.

4) Remove the MIC Fixing plate by loosening the two M4x12 screws.

5) Separate the Diode Limitter, Filter Wave Guide .2. and Window from MIC Assy. by loosening the four M4 nuts.

B. FR-1525D(A)

1) 2) 3) } Same as the mentioned about FR-1505/1510D(A).

4) Remove the Filter Wave Guide Ass'y. by loosening the four M4x15 screws.

5) Remove the MIC Fixing plate by loosening the two M4x12 screws.

6) Separate the Diode Limitter from the MIC Assy. by loosening the four M4 nuts.

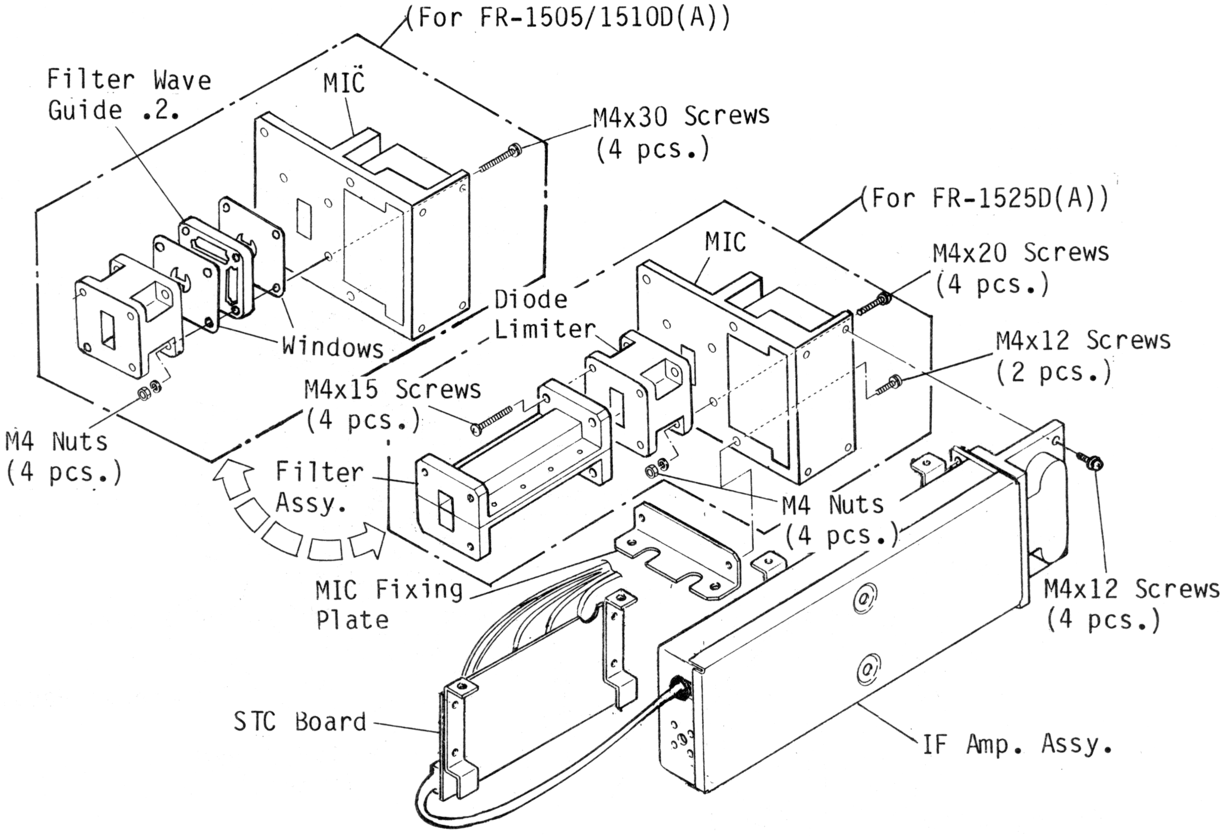

(For FR-1505/1510D(A))
Filter Wave Guide .2.
MIC
M4x30 Screws (4 pcs.)
(For FR-1525D(A))
MIC
M4x20 Screws (4 pcs.)
Diode Limiter
M4x12 Screws (2 pcs.)
Windows
M4x15 Screws (4 pcs.)
M4 Nuts (4 pcs.)
Filter Assy.
M4 Nuts (4 pcs.)
M4x12 Screws (4 pcs.)
MIC Fixing Plate
STC Board
IF Amp. Assy.

Fig. 1-12

BEARING SIGNAL GENERATOR Board (MP-3795)

1) Open the bow side scanner housing cover by loosening four fixing bolts. See Fig. 1-13.

2) Disconnect two plugs (P901 and P902) from the board.

3) Loosen two M3x6 screws securing the board to the motor fixing plate and take out the board.

Scanner Motor

1) Remove the BEARING SIGNAL GENERATOR board (MP-3795) as mentioned above.

2) Loosen four M6x12 bolts "A" and remove the scanner motor together with the motor fixing plate. See Fig. 1-13.

3) Remove the circlip and remove the antenna drive gear.

4) Disconnect the lead wires of the scanner motor.

5) Separate the motor from the motor fixing plate by loosening four M6x12 bolts "B".

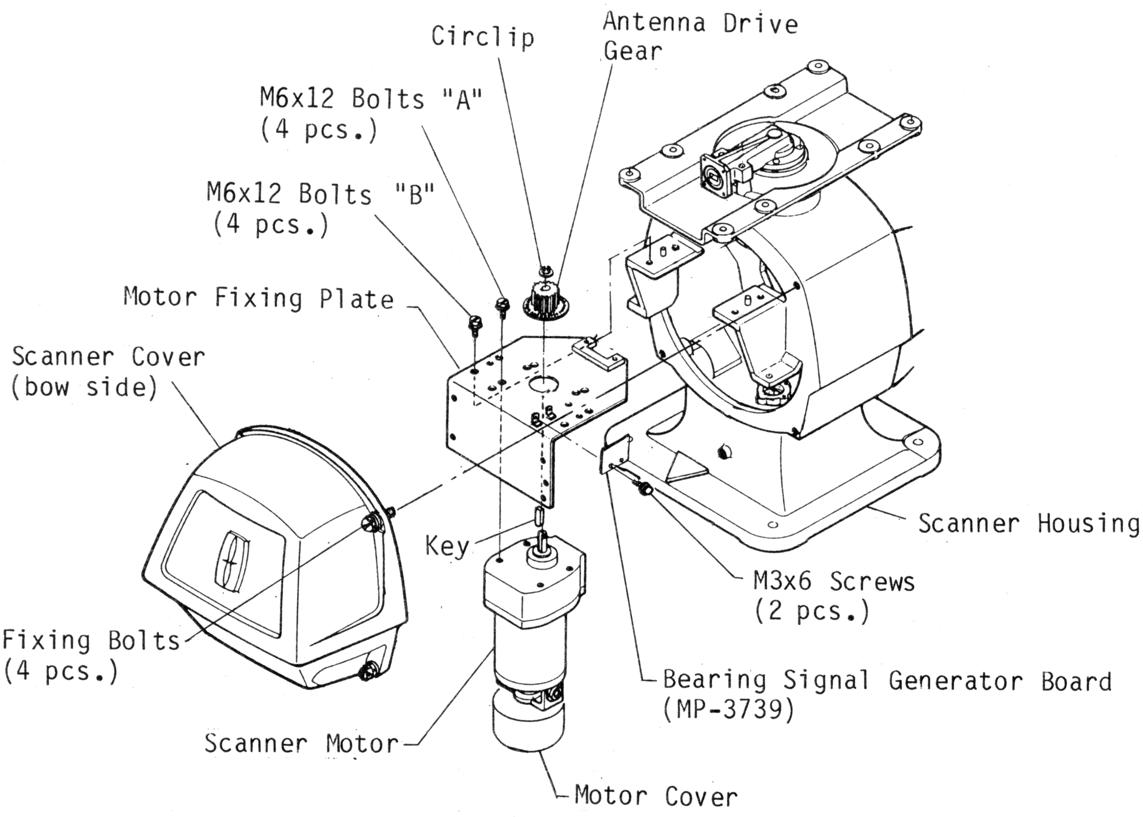

Circlip
Antenna Drive Gear
M6x12 Bolts "A" (4 pcs.)
M6x12 Bolts "B" (4 pcs.)
Motor Fixing Plate
Scanner Cover (bow side)
Key
Fixing Bolts (4 pcs.)
Scanner Motor
Motor Cover
Scanner Housing
M3x6 Screws (2 pcs.)
Bearing Signal Generator Board (MP-3739)

Fig. 1-13

CHAPTER 2. TROUBLESHOOTING

Note: This troubleshooting is applied to the radar display and scanner units only. That is, trouble due to outside factors, e.g. ship's mains, cable disconnection, wrong operation and so on, is not taken into account.

Check steps Symptoms	1	2	3	4
Power is not applied.	Main fuse F1351	POWER SUPPLY PCB PTU-6982	FILTER PCB FIL-6983	
Scanner does not rotate.	Scanner fuse F1352	POWER SUPPLY PCB PTU-6982	Scanner motor B801	
Nothing appears on the screen.	CRT ASSY. 3A fuse, etc.	POWER SUPPLY PCB PTU-6982 +24V line		
Marks/legends do not appear.	PROCESSOR PCB 03P6977 U36, U76 - U79, etc.			
Neither echo nor noise appears.	IF AMP PCB BIF-4879 or BIF-5668	INTERFACE PCB 03P6980 U1	PROCESSOR PCB 03P6977	
Only echo does not appear.	TX fuse F1 TX HV PCB HV-7130	Magnetron V801 SCR CR813 (CR814)	MOD. TRIG. PCB 03P5732 or RF-5144 U850, Q850/853/854	MODULATOR PCB 03P5686 or MD-5145
Echo appears but poor sensitivity.	Magnetron V801	MIC U801	Diode limiter CR810	PANEL PCB 03P6978 VR12,VR3,VR9
Bearing does not synchronize with antenna.	BEARING SIGNAL GEN. PCB MP-3795 S801, Timing disk	PROCESSOR PCB 03P6977 U115, U116, U119, etc.	INTERFACE PCB 03P6980	
Abnormal bearing of picture	PANEL PCB 03P6978 S1	PROCESSOR PCB 03P6977		
Abnormal synchronization of picture	CRT ASSY. VR41	PROCESSOR PCB 03P6977 U36, U60, etc.	INTERFACE PCB 03P6980	
No STC effect	STC PCB STC-6995 U1	PANEL PCB 03P6978 VR5, VR10	INTERFACE PCB 03P6980	

Check steps Symptoms		1	2	3	4
No FTC effect		PROCESSOR PCB 03P6977 CR17 - CR19	PANEL PCB 03P6978 VR11	STC PCB STC-6995 U1	INTERFACE PCB 03P6980
EBL does not operate.		EBL PCB 03P6981 S1 - S3	PROCESSOR PCB 03P6977 U108/100/4		
VRM does not operate.		VRM PCB 03P6981 S1 - S3	PROCESSOR PCB 03P6977 U109/100/4		
Touchpad key does not function.	− +	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U1/87/100	ILLUMINATION PCB 03P6979	
	PULSE	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U1/100/111	MODULATOR PCB 03P5686 or MD-5145 K1/2/3	MOD TRIGGRER PCB 03P5732 or RF-5144
	STBY/TX	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U1	ILLUMINATION PCB 03P6979	
	SHIFT	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U1/35/36	ILLUMINATION PCB 03P6979	
	MODE	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U1	ILLUMINATION PCB 03P6979	
	RING	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U1/78	ILLUMINATION PCB 03P6979	
	HM OFF	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U1/79	ILLUMINATION PCB 03P6979	
	MARK BRILL	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U2/98/100	ILLUMINATION PCB 03P6979	
	H M BRILL	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U2/98/100	ILLUMINATION PCB 03P6979	
	PERF.M	FLAT KEYBOARD 03P6984	INTERFACE PCB 03P6980 K1, F2	PROCESSOR PCB 03P6977 U2/17/111	ILLUMINATION PCB 03P6979

Check steps Symptoms		1	2	3	4
Touchpad key does not function.	IR	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U2/34/65	ILLUMINATION PCB 03P6979	
	GUARD ALARM	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U2, many IC's	ILLUMINATION PCB 03P6979	
	ECHO STRETCH	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U2/117/17	ILLUMINATION PCB 03P6979	
	ECHO AVG	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U2/80/100	ILLUMINATION PCB 03P6979	
	ECHO TRAIL	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U2/89/97	ILLUMINATION PCB 03P6979	
	X 2 ZOOM	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U3/35/36	ILLUMINATION PCB 03P6979	
	↑ ← → ↓	FLAT KEYBOARD 03P6984	PROCESSOR PCB 03P6977 U3	ILLUMINATION PCB 03P6979	

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	ASSEMBLY 組品	(参照図番 REF. DWG. NO. C3307-007-D)		
	電源基板組品 POWER SUPPLY MODULE	(03P6982)		
	RDP59-1		008-104-000	FR-1505 12VDC XN-2/3/3A
	RDP59-2		008-103-990	FR-1505/1525 24/32VDC XN-2/3/3A
	RDP60-1		008-103-980	FR-1510 24/32VDC XN2/3/3A
	RDP60-2		008-103-970	FR-1510 24/32VDC XN-2/3/3A
	RDP60-4		008-103-960	FR-1510 24VDC XN-4A
	RDP61-4		008-103-950	FR-1525 24VDC XN-4A
	フィルタ組品 FILTER ASSY.			
	RDP-059/060 12V		008-103-640	FOR 12VDC MAINS
	RDP-059/060/061 24V/32V		008-103-650	FOR 24/32V DC MAINS
	送信高圧基板組品 TX HV BOARD ASSY.			
	RDP-059/060		008-103-600	FOR 5/10kW
	RDP-061		008-104-940	FOR 25kW
	信号処理基板組品 PROCESSOR BOARD ASSY.			
	A03P6977		008-102-860	STANDARD TYPE
	B03P6977		008-105-100	N-TYPE
	インターフェース基板組品 INTERFACE BOARD ASSY.			
	03P6977		008-103-610	
	パネル組品 FRONT PANEL ASSY.			
	03P6978		008-105-610	
	フラットキーボード TOUCHPAD KEYBOARD			
	03P6984-00	03S6984	000-111-152	FOR OUTSIDE JAPAN
	03P6953-00	03S6953	000-111-151	FOR JAPAN
	03P6985-00	03S6985	000-111-153	FOR N-TYPE
	照明基板組品 ILLUMINATION BOARD ASSY.			
	03P6979		008-103-620	
	エンコーダ基板組品 (EBL/VRM) ENCODER BOARD ASSY. (EBL/VRM)			
	03P6981		008-103-630	
	CRT組品 CRT ASSY.			
	TR1523X9A		000-110-817	

1B1 指示部筐体 PARTS IN DISPLAY UNIT OTHER THAN PCBS (参照図番：REF. DWG. NO. : C3307-007-D)

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	MOTOR	ﾓｰﾀｰ		
1B01B0001	MD625B-24-F2	03S6754	000-107-513	
	TERMINAL BOARD	ﾀｰﾐﾅﾙ ﾎﾞｰﾄﾞ		
1B01DT0001	ULP903B-2P		000-111-135	
1B01DT0002	A-07N-610-1P	13-3-4772-1	000-100-177	
	FUSE	ﾋｭｰｽﾞ		
1B01F0001	JSO 0.5A 125V	00S0139-1	000-549-060	
1B01F1351	FGB0 25A AC125V	00S0081	000-549-016	FOR12VDC
	JSO 10A 125V	00S0139-1	000-549-065	FOR24VDC
1B01F1352	FGB0-A 5A AC125V	JSO 5A 125V	000-549-064	

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	JACK	ｼﾞｬｯｸ		
1B01J1351	SMR-02V-B,2P		000-505-367	
	LYM-001T-0.6		000-505-487	2PCS
1B01J1352	MLR-02		000-505-770	
	SLM-01T-1.3		000-505-394	2PCS
	PLUG	ﾌﾟﾗｸﾞ		
1B01P0002	FRC2-1153	03S7127	000-110-503	
1B01P0003	H6P-SHF-AA,6P	NH HOUSING	000-505-599	
	LHF-001T-0.8BS		000-505-504	6PCS
1B01P0004	VHR-6N		000-505-890	
	BVH-21T-P1.1		000-100-049	6PCS
1B01P0005	VHR-7N		000-505-891	
	BVH-21T-P1.1		000-100-049	7PCS
1B01P0006	VHR-4N		000-505-887	
	BVH-21T-P1.1		000-100-049	4PCS
1B01P0007	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	LHF-001T-0.8BS		000-505-504	3PCS
1B01P0008	H18P-SHF-AA,18P		000-505-613	
	LHF-001T-0.8BS		000-505-504	18PCS
1B01P0009	H5P-SHF-AA,5P	NH HOUSING	000-505-598	
	LHF-001T-0.8BS		000-505-504	5PCS
1B01P0010	H6P-SHF-AA,6P	NH HOUSING	000-505-599	
	LHF-001T-0.8BS		000-505-504	6PCS
1B01P0018	H9P-SHF-AA,9P	NH HOUSING	000-505-602	
	LHF-001T-0.8BS		000-505-504	9PCS
1B01P0019	H4P-SHF-AA,4P	NH HOUSING	000-505-597	
	LHF-001T-0.8BS		000-505-504	4PCS
1B01P0020	H5P-SHF-AA,5P	NH HOUSING	000-505-598	
	LHF-001T-0.8BS		000-505-504	5PCS
1B01P0103	H8P-SHF-AA,8P	NH HOUSING	000-505-601	
	LHF-001T-0.8BS		000-505-504	8PCS
1B01P0104	H13P-SHF-AA,13P	NH HOUSING	000-505-610	
	LHF-001T-0.8BS		000-505-504	13PCS
1B01P0105	H12P-SHF-AA,12P	NH HOUSING	000-505-605	
	LHF-001T-0.8BS		000-505-504	12PCS
1B01P0106	H12P-SHF-AA,12P	NH HOUSING	000-505-605	
	LHF-001T-0.8BS		000-505-504	12PCS
1B01P0107	FRC2-1153	03S7127	000-110-503	
1B01P0108	H6P-SHF-AA,6P	NH HOUSING	000-505-599	
	LHF-001T-0.8BS		000-505-504	6PCS
1B01P0109	VHR-6N		000-505-890	
	BVH-21T-P1.1		000-100-049	6PCS
1B01P0201	H13P-SHF-AA,13P	NH HOUSING	000-505-610	
	LHF-001T-0.8BS		000-505-504	13PCS
1B01P0202	H12P-SHF-AA,12P	NH HOUSING	000-505-605	
	LHF-001T-0.8BS		000-505-504	12PCS
1B01P0205	H4P-SHF-AA,4P	NH HOUSING	000-505-597	
	LHF-001T-0.8BS		000-505-504	4PCS
1B01P0301	H18P-SHF-AA,18P		000-505-613	
	LHF-001T-0.8BS		000-505-504	18PCS
1B01P0302	H8P-SHF-AA,8P	NH HOUSING	000-505-601	
	LHF-001T-0.8BS		000-505-504	8PCS
1B01P0303	H4P-SHF-AA,4P	NH HOUSING	000-505-597	
	LHF-001T-0.8BS		000-505-504	4PCS
1B01P0304	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	LHF-001T-0.8BS		000-505-504	3PCS
1B01P0305	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	LHF-001T-0.8BS		000-505-504	3PCS
1B01P0306	H6P-SHF-AA,6P	NH HOUSING	000-505-599	
	LHF-001T-0.8BS		000-505-504	6PCS
1B01P0307	H5P-SHF-AA,5P	NH HOUSING	000-505-598	
	LHF-001T-0.8BS		000-505-504	5PCS
1B01P0402	H4P-SHF-AA,4P	NH HOUSING	000-505-597	
	LHF-001T-0.8BS		000-505-504	4PCS
1B01P0403	VHR-4N		000-505-887	
	BVH-21T-P1.1		000-100-049	4PCS
1B01P0405	VHR-7N		000-505-891	
	BVH-21T-P1.1		000-100-049	7PCS
1B01P0442	LP-02-1		000-505-458	
	SLF-01T-2.0		000-505-391	2PCS
1B01P0501	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	LHF-001T-0.8BS		000-505-504	3PCS
1B01P0502	H6P-SHF-AA,6P	NH HOUSING	000-505-599	
	LHF-001T-0.8BS		000-505-504	6PCS
1B01P0503	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	LHF-001T-0.8BS		000-505-504	3PCS
1B01P0504	H6P-SHF-AA,6P	NH HOUSING	000-505-599	
	LHF-001T-0.8BS		000-505-504	6PCS
1B01P0601	H9P-SHF-AA,9P	NH HOUSING	000-505-602	
	LHF-001T-0.8BS		000-505-504	9PCS
1B01P0602	H5P-SHF-AA,5P	NH HOUSING	000-505-598	
	LHF-001T-0.8BS		000-505-504	4PCS
1B01P0603	H4P-SHF-AA,4P	NH HOUSING	000-505-597	
	LHF-001T-0.8BS		000-505-504	5PCS
1B01P1351	SMP-02V-BC 2P		000-505-374	
	LHF-001T-0.8BS		000-505-504	2PCS
1B01P1352	MLP-02		000-505-750	
	SLF-01T-1.3		000-505-393	2PCS
	SWITCH	ｽｲｯﾁ		
1B01S1351	MRT-22-G5J	03S6791	000-107-692	

NOTE:

備考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	FUSE HOLDER	ヒユーズ" ホルダ"ー		
1B01XF0001	CQ-207HH 00S0140	6.4MM X 30MM	000-519-180	
1B01XF1351	FH052		000-519-181	
1B01XF1352	CQ-207HH 00S0140	6.4MM X 30MM	000-519-180	
1B2	電源基板 POWER SUPPLY BOARD	03P6982	(参照図番 : REF. DWG. NO. : C3307-006-C)	
	CAPACITOR	コンデ"ンサー		
1B02C0001	ECE-A1AFS472	4700UF 10V	000-110-151	
1B02C0002	ECE-A1AFS472	4700UF 10V	000-110-151	
1B02C0003	ECE-A1HFS471	470UF 50V	000-110-152	
1B02C0004	ECE-A1HFS471	470UF 50V	000-110-152	
1B02C0005	ECQ-M1472KZW	4700PF 100V	000-104-800	
1B02C0006	ECE-A1CU101E	100UF 16V	000-206-112	
1B02C0007	ECE-A1CFS471	470UF 16V	000-110-153	
1B02C0008	ECE-A1CU221E	220UF 50V	000-201-673	
1B02C0009	ECE-A1CFS471	470UF 16V	000-110-153	
1B02C0010	ECE-A1CU221E	220UF 50V	000-201-673	
1B02C0011	ECE-A1CFS471	470UF 16V	000-110-153	
1B02C0012	ECE-A1CU221E	220UF 50V	000-201-673	
1B02C0013	ECE-A1HU010E	1UF 50V	000-206-115	
1B02C0014	ECE-A1HU220E	22MF 50V	000-201-833	
1B02C0015	ECE-B2WS3R3	3.3UF 450V	000-203-400	
1B02C0016	ECE-S1HV472S	4700UF	000-108-664	
1B02C1301	ECQ-V1H105JZW	1UF 50V	000-104-801	
1B02C1302	ECQ-V1H105JZW	1UF 50V	000-104-801	
1B02C1303	ECQ-V1H105JZW	1UF 50V	000-104-801	
1B02C1304	ECE-A1HFS471	470UF 50V	000-110-152	
1B02C1305	ECE-A1HFS471	470UF 50V	000-110-152	
1B02C1306	ECE-A1HFS471	470UF 50V	000-110-152	
1B02C1307	ECE-A1HFS471	470UF 50V	000-110-152	
1B02C1308	ECE-A1HFS471	470UF 50V	000-110-152	
1B02C1309	ECE-A1HFS471	470UF 50V	000-110-152	
1B02C1310	ECQ-F4822KZ	8200PF 400V	000-107-074	
1B02C1311	ECQ-F4822KZ	8200PF 400V	000-107-074	
1B02C1314	ECE-A1CU101E	100UF 16V	000-206-112	
1B02C1317	ECQ-M1H154KV	0.15UF 50V	000-105-002	
1B02C1318	ECQ-M1H103KVW	0.01UF 50V	000-260-416	
1B02C1319	ECQ-MIH332KVW	3300PF 50V	000-260-413	
1B02C1320	ECE-A1CU330E	33UF 50V	000-201-674	
	DIODE	ダ"イオート"		
1B02CR0001	ESAC92-02	BRIDGE	000-104-806	
1B02CR0002	CTG-24S		000-110-154	
1B02CR0003	1S2095A		000-113-046	
1B02CR0004	RK44-LF-K1	C17.5	000-111-765	
1B02CR0005	RK44-LF-K1	C17.5	000-111-765	
1B02CR0006	RK44-LF-K1	C17.5	000-111-765	
1B02CR0007	RK44-LF-K1	C17.5	000-111-765	
1B02CR0008	1S2462		000-113-090	
1B02CR0009	HZT33	ZENER	000-105-934	
1B02CR0011	CTG-24R		000-110-155	
1B02CR0012	TLR124		000-135-883	
1B02CR1301	RM4Z-LF-K1		000-111-764	
	JACK	ジ"ャック		
1B02J0401	B6P-VH	6P	000-505-824	
1B02J0402	B4P-SHF-1AA-K	4P	000-100-573	
1B02J0403	B4P-VH	4P	000-505-822	
1B02J0404	B3P-VH	3P	000-505-821	
1B02J0405	B7P-VH	7P	000-505-825	
	RELAY	リレー		
1B02K0001	SCD5A	13-3-5002	000-573-134	
	COIL	コイル		
1B02L0001	HP-053		000-110-156	
1B02L0002	HP-034S		000-110-157	
1B02L0003	SN-3-205	04S4156-0	000-103-758	
1B02L0004	SN-3-205	04S4156-0	000-103-758	
1B02L0005	SN-3-205	04S4156-0	000-103-758	
1B02L0006	SN-3-205	04S4156-0	000-103-758	
1B02L0007	HP-024S		000-101-858	
	PLUG	プ°ラグ"		
1B02P0443	LP-02-1		000-505-458	
	SLM-01T-2.0		000-505-392	
	TRANSISTOR	トランジ"スター		
1B02Q0001	2SK737(1)	03S6919	000-109-769	
1B02Q1301	2SK798(1)	03S7068	000-110-158	
1B02Q1302	2SK798(1)	03S7068	000-110-158	
1B02Q1305	2SB941AP		000-121-302	
	RESISTOR	テイコウ		
1B02R0001	ERD-25PJ332	0.25W 3.3K	000-330-369	
1B02R0002	ERD-25PJ102	0.25W 1.0K	000-330-357	
1B02R0003	ERD-25PJ392	0.25W 3.9K	000-330-371	
1B02R0004	ERD-25PJ100	0.25W 10	000-330-309	
1B02R0005	RW-1 0.1OHM J		000-104-811	
1B02R0006	ERG-2SJ150P	00S0102-0	000-375-451	
1B02R0007	ERD-25PJ102	0.25W 1.0K	000-330-357	
1B02R0008	ERD-25PJ102	0.25W 1.0K	000-330-357	
1B02R0009	ERD-25PJ123	0.25W 12K	000-330-383	
1B02R0010	ERD-25PJ222	0.25W 2.2K	000-330-365	
1B02R0011	ERD-25PJ122	0.25W 1.2K	000-330-359	
1B02R0012	ERD-25PJ270	0.25W 27	000-330-319	
1B02R0013	ERX-1SJ1R5P	1W 1.5	000-375-373	
1B02R0014	ERG-3SJ273P	00S0102-0	000-375-557	
1B02R0015	ERG-3SJ273P	00S0102-0	000-375-557	
1B02R0016	ERG-3SJ273P	00S0102-0	000-375-557	
1B02R0017	ERG-3SJ273P	00S0102-0	000-375-557	
1B02R0018	ERG-2SJ152P	2W 1.5K	000-375-476	
1B02R0019	ERX-2SJR22P	2W 0.22	000-375-427	
1B02R0020	ERD-25PJ270	0.25W 27	000-330-319	
1B02R0021	ERX-1SJ1R0P	00S0102-0	000-375-371	
1B02R1301	LF145R1G	0.25W 5.1	000-104-813	
1B02R1302	LF145R1G	0.25W 5.1	000-104-813	
1B02R1305	ERG-3SJ100P	3W 10	000-375-514	
1B02R1306	ERG-3SJ100P	3W 10	000-375-514	
1B02R1315	ERD-25PJ823	0.25W 82K	000-330-403	
1B02R1316	ERD-25PJ823	0.25W 82K	000-330-403	
1B02R1317	ERD-25PJ823	0.25W 82K	000-330-403	
	TRANSFORMER	トランス		
1B02T0001	RT-6951	03S6951	000-110-161	
1B02T0002	RT-7128		000-110-330	5/25KW
	RT-7129		000-110-331	10KW
1B02T0003	RT-6951	03S6951	000-110-161	
	TEST POINT	テストポ°イント		
1B02TP0001	LC-2-S-YELLOW		000-537-970	
1B02TP0002	LC-2-S-BLACK		000-537-971	
1B02TP0003	LC-2-S-YELLOW		000-537-970	
1B02TP0004	LC-2-S-YELLOW		000-537-970	
1B02TP0005	LC-2-S-YELLOW		000-537-970	
1B02TP0006	LC-2-S-YELLOW		000-537-970	
1B02TP0007	LC-2-S-YELLOW		000-537-970	
1B02TP0008	LC-2-S-YELLOW		000-537-970	
1B02TP0009	LC-2-S-YELLOW		000-537-970	
1B02TP0010	LC-2-S-BLACK		000-537-971	
	INTEGRATED CIRCUIT	シユウセキカイロ		
1B02U0001	TLP521-1Y		000-135-834	
1B02U0002	TLP521-1Y		000-135-834	
1B02U0003	TLP521-1Y		000-135-834	
1B02U0004	RC6221	03S6221	000-104-532	
1B02U0005	TLP521-1Y		000-135-834	
1B02U1301	RC-7246	03S7246	000-110-956	
1B02U1302	RC6220	03S6220	000-104-531	
	POTENTIOMETER	ポ°テンシヨメーター		
1B02VR0001	EVM-MCGA01B52	00S0119-1	000-103-592	
1B3	フィルター基板 FILTER BOARD	03P6983	(参照図番 : REF. DWG. NO. : C3307-007-D)	
	CAPACITOR	コンデ"ンサー		
1B03C1351	ECE-A1HF221	220UF 50V	000-201-630	
1B03C1352	ECE-A1HF221	220UF 50V	000-201-630	
1B03C1355	ECE-A1HF221	220UF 50V	000-201-630	
1B03C1356	ECE-A1HF221	220UF 50V	000-201-630	
	COIL	コイル		
1B03L1301	SC-20-100	03S5756	000-100-077	

NOTE:

備 考:

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
	PLUG	ﾌﾟﾗｸﾞ		
1B03P0401	VHR-6N		000-505-890	
	BVH-21T-P1.1		000-100-049	6PCS

1B4 送信高圧基板 TX HV BOARD 参照図番： REF. DWG. NO. : (C3307-004-D A HV-7130 --- 25kW / C3307-005-F B HV-7130 --- 5/10kW)

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
	CAPACITOR	ｺﾝﾃﾞﾝｻｰ		
1B04C0441	ECE-A2WS3R3	3.3UF 450V	000-110-328	25KWONLY
1B04C0442	MDD-2-2G-474K	0.47UF 450V	000-104-440	25KWONLY
1B04C0443	MDD-2-2G-474K	0.47UF 450V	000-104-440	25KWONLY
1B04C0444	ECE-A2WS100	100UF 350V	000-106-334	25KWONLY
1B04C0445	ECE-A2WS100	100UF 350V	000-106-334	25KWONLY
	DIODE	ﾀﾞｲｵｰﾄﾞ		
1B04CR0441	RU4DS		000-110-329	
1B04CR0442	RU4DS		000-110-329	
1B04CR0443	RU4DS		000-110-329	
1B04CR0444	RU4DS		000-110-329	
1B04CR0445	RU4DS		000-110-329	
1B04CR0446	RU4DS		000-110-329	
1B04CR0447	RU4DS		000-110-329	25KWONLY
1B04CR0448	RU4DS		000-110-329	25KWONLY
1B04CR0449	RU4DS		000-110-329	25KWONLY
1B04CR0450	RU4DS		000-110-329	25KWONLY
1B04CR0451	RU4DS		000-110-329	25KWONLY
1B04CR0452	RU4DS		000-110-329	25KWONLY
	JACK	ｼﾞｬｯｸ		
1B04J0441	LR-03-1		000-505-468	
	SLM-01T-2.0		000-505-392	3PCS
1B04J0442	LR-02F-1		000-505-450	
	SLM-01T-2.0		000-505-392	2PCS
1B04J0443	LR-02F-1		000-505-450	
	SLF-01T-2.0		000-505-391	2PCS
	COIL	ｺｲﾙ		
1B04L0441	RL-3742		000-733-742	
1B04L0442	RL-3742		000-733-742	25KWONLY
	RESISTOR	ﾃｲｺｳ		
1B04R0441	ERG-3SJ273P	00S0102-0	000-375-557	25KWONLY
1B04R0442	ERG-3SJ273P	00S0102-0	000-375-557	25KWONLY
1B04R0443	ERG-3SJ273P	00S0102-0	000-375-557	25KWONLY
1B04R0444	ERG-3SJ273P	00S0102-0	000-375-557	25KWONLY

1B6 インターフェース基板 INTERFACE BOARD 03P6980 (参照図番： REF. DWG. NO. : C3307-010-D)

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
	CAPACITOR	ｺﾝﾃﾞﾝｻｰ		
1B06C0001	ECE-A1CU100E	10UF 16V	000-201-672	
1B06C0002	ECE-A1CU101E	100UF 16V	000-206-112	
1B06C0003	ECE-A1CU101E	100UF 16V	000-206-112	
1B06C0004	ECE-A1CU100E	10UF 16V	000-201-672	
1B06C0005	ECE-A1CU101E	100UF 16V	000-206-112	
1B06C0007	ECQ-V1H105JZ	1MF 50V	000-261-536	
	DIODE	ﾀﾞｲｵｰﾄﾞ		
1B06CR0001	1S1588		000-112-795	
1B06CR0002	1S1588		000-112-795	
1B06CR0003	1S1588		000-112-795	
1B06CR0004	1S1588		000-112-795	
	CONNECTOR	ｺﾈｸﾀｰ		
1B06DJ0001	57D-M328JD-D8		000-505-140	
	RDAA-1007		353-210-070	2PCS
	JACK	ｼﾞｬｯｸ		
1B06J0002	FRC2-C26S13-0L	26P	000-505-156	
1B06J0003	B6P-SHF-1AA-K	6P	000-100-584	
1B06J0004	B6P-VH	6P	000-505-824	
1B06J0005	B7P-VH	7P	000-505-825	
1B06J0006	B4P-VH	4P	000-505-822	
1B06J0007	B3P-SHF-1AA-K	3P	000-100-572	
1B06J0008	B18P-SHF-1AA-K	ZENER	000-107-657	
1B06J0009	B5P-SHF-1AA-K	5P	000-100-582	
1B06J0010	B6P-SHF-1AA-K	6P	000-100-584	
1B06J0011	B5P-SHF-1AA-K	5P	000-100-582	
1B06J0012	B6P-SHF-1AA-K	6P	000-100-584	
1B06J0013	B4P-SHF-1AA-K	4P	000-100-573	
1B06J0014	B5P-SHF-1AA-K	5P	000-100-582	
1B06J0015	B8P-SHF-1AA-K	13-3-3809-1	000-100-592	
1B06J0016	B9P-SHF-1AA-K	13-3-3809-1	000-100-593	
1B06J0017	ML-30AP-5P		000-110-172	
1B06J0018	B9P-SHF-1AA-K	13-3-3809-1	000-100-593	
1B06J0019	B4P-SHF-1AA-K	4P	000-100-573	
1B06J0020	B5P-SHF-1AA-K	5P	000-100-582	
1B06J0021	B8P-SHF-1AA-K	13-3-3809-1	000-100-592	
1B06J0022	B8P-SHF-1AA-K	13-3-3809-1	000-100-592	
1B06J0023	B4P-SHF-1AA-K	4P	000-100-573	
1B06J0024	B13P-SHF-1AA-K	13P	000-100-597	
1B06J0025	B4P-SHF-1AA-K	4P	000-100-573	
1B06J0026	B3P-SHF-1AA-K	3P	000-100-572	
1B06J0027	ML-30BP-4P		000-110-816	
1B06J0028	B3P-VH	3P	000-505-821	
1B06J0201	CN-3561 1P (F)		000-510-559	
	RELAY	ﾘﾚｰ		
1B06K0001	JD2-DC12V(AJD421)		000-110-174	
	TRANSISTOR	ﾄﾗﾝｼﾞｽﾀｰ		
1B06Q0001	2SA495GTM-O		000-116-992	
1B06Q0002	2SA495GTM-O		000-116-992	
1B06Q0003	2SC752GTM-O		000-124-129	
	RESISTOR	ﾃｲｺｳ		
1B06R0001	ERD-25PJ332	0.25W 3.3K	000-330-369	
1B06R0002	ERD-25PJ471	0.25W 470	000-330-349	
1B06R0003	ERD-25PJ471	0.25W 470	000-330-349	
1B06R0004	ERD-25TJ103	0.25W 10K	000-330-381	
1B06R0005	ERD-25PJ820	0.25W 82	000-330-331	
1B06R0006	ERD-25PJ820	0.25W 82	000-330-331	
1B06R0007	EXB-F5E103J	10KX4	000-379-082	
1B06R0008	ERD-25PJ102	0.25W 1.0K	000-330-357	
1B06R0009	ERD-25PJ472	0.25W 4.7K	000-330-373	
	SWITCH	ｽｲｯﾁ		
1B06S0001	SM-44000-39		000-110-175	
	INTEGRATED CIRCUIT	ｼｭｳｾｷｶｲﾛ		
1B06U0001	RC-6222	03S6222-1	000-104-527	

1B7 パネル基板 PANEL BOARD 03P6978 (参照図番： REF. DWG. NO. : C3307-012-B)

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
	CAPACITOR	ｺﾝﾃﾞﾝｻｰ		
1B07C0001	ECC-W1H820JC5	82PF 50V	000-256-424	
1B07C0002	RPE132CH101J50	100PF 50V	000-104-505	
1B07C0003	RPE132F104Z50	0.1UF 50V	000-104-501	
	DIODE	ﾀﾞｲｵｰﾄﾞ		
1B07CR0001	SLP-384H-51-A		000-132-875	
1B07CR0002	SLP-384H-51-A		000-132-875	
1B07CR0003	SLP-384H-51-A		000-132-875	
1B07CR0004	1S1588		000-112-795	
1B07CR0005	1S1588		000-112-795	
1B07CR0006	TLR124		000-135-883	
	JACK	ｼﾞｬｯｸ		
1B07J0301	B18P-SHF-1AA-K	ZENER	000-107-657	
1B07J0302	B8P-SHF-1AA-K	13-3-3809-1	000-100-592	
1B07J0303	B4P-SHF-1AA-K	4P	000-100-573	
1B07J0304	B3P-SHF-1AA-K	3P	000-100-572	
1B07J0305	B3P-SHF-1AA-K	3P	000-100-572	

NOTE:
備 考:

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
1B07J0306	B6P-SHF-1AA-K	6P	000-100-584	
1B07J0307	B5P-SHF-1AA-K	5P	000-100-582	
	LOUDSPEAKER	ｽﾋﾟｰｶｰ		
1B07LS0001	PKB8-4A0		000-580-606	
	TRANSISTOR	ﾄﾗﾝｼﾞｽﾀｰ		
1B07Q0001	2SD313E		000-127-527	
	RESISTOR	ﾃｲｺｳ		
1B07R0001	ERD-25PJ272	0.25W 2.7K	000-330-367	
1B07R0002	ERD-25PJ330	0.25W 33	000-330-321	
1B07R0003	ERD-25PJ470	0.25W 47	000-330-325	
1B07R0004	ERD-25TJ103	0.25W 10K	000-330-381	
1B07R0005	ERD-25PJ101	0.25W 100	000-330-333	
1B07R0006	ERD-25PJ222	0.25W 2.2K	000-330-365	
1B07R0007	ERD-25TJ103	0.25W 10K	000-330-381	
1B07R0008	ERD-25TJ103	0.25W 10K	000-330-381	
1B07R0009	ERD-25PJ102	0.25W 1.0K	000-330-357	
1B07R0010	EXB-F5E472J	0.125W 4.7KX4	000-379-073	
1B07R0011	ERD-25PJ682	0.25W 6.8K	000-330-377	
	SWITCH	ｽｲﾂﾁ		
1B07S0001	S-1130		000-107-082	
1B07S0002	SKHHBS		000-110-295	
1B07S0003	SKHHBS		000-110-295	
1B07S0004	SKHHBS		000-110-295	
1B07S0135	ST-115D22		000-470-062	
	TEST POINT	ﾃｽﾄﾎﾟｲﾝﾄ		
1B07TP0004	LC-2-S-YELLOW		000-537-970	
1B07TP0005	LC-2-S-BLACK		000-537-971	
	INTEGRATED CIRCUIT	ｼﾕｳｾｷｶｲﾛ		
1B07U0001	HD74LS221P		000-162-530	
	POTENTIOMETER	ﾎﾟﾃﾝｼﾖﾒｰﾀｰ		
1B07VR0001	EVHR1A230B13	1K,B	000-100-103	
1B07VR0002	EVHR1A230B13	1K,B	000-100-103	
1B07VR0003	EVHR1A230B23	2K,B	000-100-039	
1B07VR0004	EVH-Y03S20B53	03S6540-1	000-107-098	
1B07VR0005	EVHR1A230B53	5K,B	000-100-104	
1B07VR0006	EVHR1A230B23	2K,B	000-100-039	
1B07VR0007	EVM-MCGA01B24	20K (00S0119)	000-103-591	
1B07VR0008	EVM-MCGA01B54	50K	000-103-590	
1B07VR0009	EVM-MCGA01B23	2K	000-103-630	
1B07VR0010	EVM-MCGA01B14	10K	000-103-632	
1B07VR0011	EVM-MCGA01B53	5K (00S0119)	000-103-631	
1B07VR0012	EVJ-RQAS10B24	03S7126	000-110-506	
1B07VR0013	EVM-MCGA01B22	200 (00S0119)	000-103-629	

1B9 照明基板 ILLUMINATION BOARD 03P6979 (参照図番 : REF. DWG. NO. : C3307-007-D)

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
	DIODE	ﾀﾞｲｵｰﾄﾞ		
1B09CR0001	SLP-384H-51-A		000-132-875	
1B09CR0002	SLP-384H-51-A		000-132-875	
1B09CR0003	SLP-384H-51-A		000-132-875	
1B09CR0004	SLP-384H-51-A		000-132-875	
1B09CR0005	SLP-384H-51-A		000-132-875	
1B09CR0006	SLP-384H-51-A		000-132-875	
	JACK	ｼﾞﾔﾂｸ		
1B09J0201	B13P-SHF-1AA-K	13P	000-100-597	
1B09J0202	B12P-SHF-1AA-K	13-3-3809-1	000-100-596	
1B09J0203	13FR-BT		000-107-101	
1B09J0204	12FR-BT		000-110-176	
1B09J0205	B4P-SHF-1AA-K	4P	000-100-573	

1B10 EBL-エンコーダ基板 EBL-ENCODER BOARD
1B11 VRM-エンコーダ基板 VRM-ENCODER BOARD
03P6981 (参照図番 : REF. DWG. NO. : C3307-008-A)

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
	DIODE	ﾀﾞｲｵｰﾄﾞ		
1B10CR0001	SLP-384H-51-A		000-132-875	
	JACK	ｼﾞﾔﾂｸ		
1B10J0501	B3P-SHF-1AA-K	3P	000-100-572	
1B10J0502	B6P-SHF-1AA-K	6P	000-100-584	
	SWITCH	ｽｲﾂﾁ		
1B10S0001	SKHJGF		000-106-624	
1B10S0002	SKHJGF		000-106-624	
1B10S0003	EWT-XABS2575B	03S7125	000-110-504	

NOTE:
備 考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	ASSEMBLY 組品			
	送受信部組品 TRANSCEIVER MODULE	(参照図番： REF. DWG. NO. : C3276-012-B 又は OR C3290-005-B)		
A300A	RTR-013		008-103-140	FR-1505D
	RTR-013A		008-103-150	FR-1505DA
	RTR-014		008-103-160	FR-1510D
	RTR-014A		008-103-170	FR-1510DA
	RTR-015		008-103-220	FR-1525D
	RTR-015A		008-103-230	FR-1525DA
	IＦセット組品 IF AMP/STC ASSY.			
	IF AMP/STC BOARDS + A-303〜A-307, A-313〜A-315 A-317, A-318	(参照図番： REF. DWG. NO. : C3307-033-A)		
	又は OR			
	IF AMP/STC BOARDS + A-308〜A-312, A-316〜A-320	(参照図番： REF. DWG. NO. : C3307-036-A)		
	RTR-013//014/015		008-103-180	D-TYPE
	RTR-013A/014A/015A		008-103-190	DA-TYPE
	MＤプリント組品 MODULATOR BOARD ASSY.	(参照図番： REF. DWG. NO. : C3307-033-A 又は OR C3307-036-A)		
	03P5686		008-311-010	FR-1505D(A) FR-1510D(A)
	MD-5145		008-200-160	FR-1525D(A)
	変調トリガープリント組品 MODULATOR TRIGGER BOARD ASSY.	(参照図番： REF. DWG. NO. : C3307-033-A 又は OR C3307-036-A)		
	03P5732		008-310-990	FR-1505D(A) FR-1510D(A)
	RF-5144		008-200-170	FR-1525D(A)
	方位パルス発生基板 BEARING SIGNAL GENERATOR BOARD ASSY.	(参照図番： REF. DWG. NO. : C3276-012-B C3290-005-B)		
	MP-3795		008-312-370	
	MIC 組品 MIC ASSY.	(参照図番： REF. DWG. NO. : C3307-013-E C3307-015-D C3307-016-E C3307-017-C)		
U801 C840 C844 CR821 P605	RF-001		008-200-540	
	スキャナ筐体部 PARTS IN SCANNER HOUSING OTHER THAN TRANSCIEVER MODULE	(参照図番： REF. DWG. NO. : C3307-013-E C3307-015-D C3307-016-E C3307-017-C)		
	MOTOR	モーター		
B 801	D8G-516(NEW)	DC24V, 30W	000-631-715	
	CAPACITOR	コンデンサー		
C 911	MD-1-2E-474K	0.47UF,250WV	000-262-009	
	PLUG	プラグ		
P 601	LP-12		000-505-460	
	SLF-01T-2.0		000-505-391	12 PCS.
P 801	LP-15		000-505-461	
	SLF-01T-2.0		000-505-391	15 PCS.
P 901	H5P-SHF-AA,5P	NH HOUSING	000-505-598	
	SHF-001T-08S		000-505-301	5 PCS.
P 902	H2P-SHF-AA,2P	NH HOUSING	000-505-595	
	SHF-001T-08S		000-505-301	2 PCS.
	SWITCH	スイッチ		
S 801	RS-1 NO 13-3-2799-0		000-478-301	
	TERMINAL BOARD	タンシバン		
TB 801	FAD14P (1 TO 14)	00S01450	000-533-508	
	FAD14P (15 TO 28)	00S01460	000-533-509	

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	送受信シャーシ PARTS IN TRANSCIEVER MODULE OTHER THAN PCBS.	(参照図番： REF. DWG. NO. : C3307-013-E C3307-015-D C3307-016-E C3307-017-C)		
	MOTOR	モーター		
B 802	109-040UL		000-430-460	FOR 25KW
	CAPACITOR	コンデンサー		
C 804	ECQ-M1H104KZ	0.1UF 50V	000-260-390	
C 840	DD104B102K50V	1000PF 50V	000-252-171	
C 844	DD106F103Z50 00S0054	0.01UF 50V	000-253-443	
	DIODE	ダイオード		
CR 803	SH5J12U		000-183-386	FOR 1 2
CR 804	HVR-3H		000-133-130	FOR 5/10KW
	MD-12N1		000-133-735	FOR 25KW
CR 810	S-LX5B		000-107-087	FOR 4 5 6
CR 813	SH16J12U		000-135-165	FOR 25KW
	SH5J12U		000-183-386	FOR 5/10KW
CR 814	SH16J12U		000-135-165	FOR 25KW
CR 815	HVR-3H		000-133-130	FOR 5/10KW
	MD-12N1		000-133-735	FOR 25KW
CR 821	RD6.8FB	ZENER	000-134-800	
	HIGH VOLTAGE PACK	コウアツパック		
HY 801	RC-3686	13-3-3687-1	000-106-851	
	JACK	ジャック		
J 601	LR-12		000-505-473	
	LLM-01T-2.0		000-505-494	12 PCS.
J 801	LR-15		000-505-475	
	SLM-01T-2.0		000-505-392	15 PCS.
	PLUG	プラグ		
P 605	H6P-SHF-AA,6P	NH HOUSING	000-505-599	
	LHF-001T-0.8BS		000-505-504	6 PCS.
P 803	VHR-3N		000-505-886	
	BVH-21T-P1.1		000-100-049	3 PCS.
P 804	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	LHF-001T-0.8BS		000-505-504	3 PCS.
P 805	VHR-9N		000-505-893	FOR 5/10KW
	BVH-21T-P1.1		000-100-049	9 PCS.
	VHR-4N		000-505-887	FOR 25KW
	SVH-21T-1.1		000-505-880	4 PCS.
P 807	VHR-2N		000-505-885	FOR 25KW
	SVH-21T-1.1		000-505-880	2 PCS.
P 808	H6P-SHF-AA,6P	NH HOUSING	000-505-599	FOR 25KW
	SHF-001T-08S		000-505-301	6 PCS.
P 810	LP-02-1		000-505-458	FOR 5/10KW
	SLF-01T-2.0		000-505-391	2 PCS.
	LP-04-1		000-505-456	FOR 25KW
	SLF-01T-2.0		000-505-391	4 PCS.
P 811	LP-09		000-505-464	FOR 25KW
	SLF-01T-2.0		000-505-391	6 PCS.
P 812	LP-09		000-505-464	FOR 5/10KW
	SLF-01T-2.0		000-505-391	9 PCS.
	LP-03-1		000-505-463	FOR 25KW
	SLF-01T-2.0		000-505-391	3 PCS.
P 813	LP-03-1		000-505-463	FOR 25KW
	SLM-01T-2.0		000-505-392	3 PCS.
P 814	LP-02-1		000-505-458	FOR 25KW
	SLF-61T-2.0		000-505-302	2 PCS.
	LP-03-1		000-505-463	FOR 5/10KW
	SLF-61T-2.0		000-505-302	3 PCS.
P 815	LP-03-1		000-505-463	FOR 25KW
	SLF-01T-2.0		000-505-391	3 PCS.
	LP-02-1		000-505-458	FOR 5/10KW
	SLF-01T-2.0		000-505-391	2 PCS.
	RESISTOR	テイコウ		
R 811	FGOS	10W 10	000-360-040	FOR 25KW
R 812	FGOS	10W 10	000-360-040	
R 818	ERD-25PJ470	0.25W 47	000-330-325	FOR 25KW
R 819	ERD-25PJ470	0.25W 47	000-330-325	FOR 25KW
	TRANSFORMER	トランス		
T 801	RT-4427-1		000-734-427	FOR 5/10KW
	RT-4037-4		000-734-037	FOR 25KW

NOTE:
備考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	TERMINAL BOARD	ﾀﾝｼﾊﾞﾝ		
TB 801	ST-A1		000-536-351	FOR 5/10KW
TB 802	ST-A1		000-536-351	FOR 5/10KW
TB 803	ST-A8		000-536-358	FOR 25KW
TB 804	ST-A8		000-536-358	FOR 25KW
TB 805	ST-A8		000-536-358	FOR 25KW
	INTEGRATED CIRCUIT	ｼﾕｳｾｷｶｲﾛ		
U 801	RU-5072-1	13-3-5072-1	000-633-686	
	ELECTRON TUBE	ﾃﾞﾝｼｶﾝ		
V 801	9M502/E3526	13-3-40111	000-101-735	FOR 5KW
	9M602		000-101-740	FOR 10KW
	M5187(F)		000-101-760	FOR 25KW
	9M752		000-101-750	FOR 25KW

変調基板 MODULATOR BOARD 03P5686 (参照図番: C3307-013-E
REF. DWG. NO. : C3307-016-E)

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	CAPACITOR	ｺﾝﾃﾞﾝｻｰ		
C 801	MD-1-2G-474K	0.47UF 400WV	000-262-091	
C 802	ECK-D3A222KBN	2200PF 1KV	000-255-755	
C 803	ECK-D3A222KBN	2200PF 1KV	000-255-755	
C 805	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 806	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 807	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 808	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 811	ECW-H10H273JD	0.027UF 1000V	000-112-077	
C 812	ECW-H10H223JR	0.022UF 1000V	000-261-953	
C 813	ECW-H06H393JD	0.039UF 600V	000-100-038	
C 814	ECW-H06H393JD	0.039UF 600V	000-100-038	
C 815	ECW-H06H393JD	0.039UF 600V	000-100-038	
C 816	ECW-H06H393JD	0.039UF 600V	000-100-038	
C 819	ECW-H10H103JR	0.01UF 1000V	000-259-571	
	DIODE	ﾀﾞｲｵｰﾄﾞ		
CR 801	DFG-1B8	13-3-5073	000-136-013	
CR 802	RM2C		000-105-012	
CR 805	DFG-1B8	13-3-5073	000-136-013	
CR 806	DFG-1B8	13-3-5073	000-136-013	
CR 807	1S1588		000-112-795	
CR 814	RM2C		000-105-012	
CR 818	DFG-1B8	13-3-5073	000-136-013	
	JACK	ｼﾞﾔﾂｸ		
J 810	LR-02F-1		000-505-450	
	SLM-01T-2.0		000-505-392	2 PCS.
J 812	LR-09		000-505-470	
	SLM-01T-2.0		000-505-392	9 PCS.
J 814	LR-03-1		000-505-468	
	SLM-01T-2.0		000-505-392	3 PCS.
J 815	LR-02F-1		000-505-450	
	SLM-01T-2.0		000-505-392	2 PCS.
	RELAY	ﾘﾚｰ		
K 801	AP59044		000-454-568	
K 802	AP59044		000-454-568	
K 803	AP59044		000-454-568	
	COIL	ｺｲﾙ		
L 801	RL-3772-3		000-733-772	
L 802	RL-3902		000-733-902	
L 803	RL6392	03S6392-0	000-105-719	
L 804	RL-3903-3	03S3903-3	000-733-903	
L 811	RL-5736-2	03S5736-2	000-100-076	
	RESISTOR	ﾃｲｺｳ		
R 803	ERX-1ANJ1R0	1W 1	000-371-055	
R 806	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 815	ERX-2ANJ2R7	2W 2.7	000-371-159	
R 816	ERX-2ANJ4R7	2W 4.7	000-371-165	
R 817	ERX-2ANJ470	2W 47	000-371-189	
R 820	RK14B2H335J	0.5W 3.3M 700V	000-376-789	
R 821	RK14B2H335J	0.5W 3.3M 700V	000-376-789	
R 822	RK14B2H335J	0.5W 3.3M 700V	000-376-789	
R 823	ERX-2ANJ470	2W 47	000-371-189	
R 824	ERX-2ANJ4R7	2W 4.7	000-371-165	
R 825	ERX-2ANJ4R7	2W 4.7	000-371-165	

変調基板 MODULATOR BOARD MD-5145 (参照図番: C3307-015-D
REF. DWG. NO. : C3307-017-C)

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	CAPACITOR	ｺﾝﾃﾞﾝｻｰ		
C 801	MD-1-2J-224K	0.22UF 630WV	000-262-150	
C 802	ECK-D3A222KB	2200PF 1KV	000-255-750	
C 803	ECK-D3A222KB	2200PF 1KV	000-255-750	
C 805	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 806	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 807	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 808	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 811	ECW-H10H153JD	15000PF	000-259-580	
C 812	ECW-H6H223JD	0.022UF	000-259-532	
C 813	ECW-H6H223JD	0.022UF	000-259-532	
C 814	ECW-H6H223JD	0.022UF	000-259-532	
C 815	ECW-H6H223JD	0.022UF	000-259-532	
C 816	ECW-H6H223JD	0.022UF	000-259-532	
C 817	ECW-H6H223JD	0.022UF	000-259-532	
C 818	ECW-H6H223JD	0.022UF	000-259-532	
C 830	ECQ-M1H104KV	0.1UF 50V	000-260-401	
C 831	ECW-H10H153JD	15000PF	000-259-580	
C 832	ECW-H10H153JD	15000PF	000-259-580	
C 833	ECW-H10H153JD	15000PF	000-259-580	
	DIODE	ﾀﾞｲｵｰﾄﾞ		
CR 801	DFG1B15		000-136-017	
CR 805	DFG-1B8	13-3-5073	000-136-013	
CR 806	DFG-1B8	13-3-5073	000-136-013	
CR 807	1S1588		000-112-795	
CR 808	DFG-1B8	13-3-5073	000-136-013	
CR 818	DFG-1B8	13-3-5073	000-136-013	
CR 819	RM2C		000-105-012	
CR 820	RM2C		000-105-012	
	JACK	ｼﾞﾔﾂｸ		
J 810	LP-04-1		000-505-456	
	SLM-01T-2.0		000-505-392	
J 811	LR-09		000-505-470	
	SLM-01T-2.0		000-505-392	
J 812	LR-03-1		000-505-468	
	SLM-01T-2.0		000-505-392	
J 813	LR-03-1		000-505-468	
	SLF-01T-2.0		000-505-391	
J 814	LR-02F-1		000-505-450	
	SLF-01T-2.0		000-505-391	
J 815	LR-03-1		000-505-468	
	SLM-01T-2.0		000-505-392	
	RELAY	ﾘﾚｰ		
K 801	AP59044		000-454-568	
K 802	AP59044		000-454-568	
K 803	AP59044		000-454-568	
	COIL	ｺｲﾙ		
L 801	RL-4036-2		000-734-036	
L 802	RL-4106-3	03S4106	000-734-106	
L 803	RL-4220-1		000-734-220	
L 804	RL-3903-3	03S3903-3	000-733-903	
L 811	RL-5315	12-3-5315	000-734-791	
	RESISTOR	ﾃｲｺｳ		
R 803	ERX-1ANJ1R0	1W 1	000-371-055	
R 806	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 813	RK14B3A105J	1W 1M 1000V	000-376-788	
R 814	RK14B3A105J	1W 1M 1000V	000-376-788	
R 815	ERF-7SK4R7	7W 4.7	000-370-951	
R 816	ERF-7SK4R7	7W 4.7	000-370-951	
R 817	ERG-3ANJ560	3W 56	000-371-435	

NOTE:
備 考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
R 820	RK14B2H335J	0.5W 3.3M 700V	000-376-789	
R 821	RK14B2H335J	0.5W 3.3M 700V	000-376-789	
R 822	RK14B2H335J	0.5W 3.3M 700V	000-376-789	
R 823	ERF-5AJ331	5W 330	000-370-744	
R 824	ERF-5AJ331	5W 330	000-370-744	
R 825	ERF-5AJ331	5W 330	000-370-744	
R 826	ERX-2ANJ4R7	2W 4.7	000-371-165	
	TRANSFORMER	ﾄﾗﾝｽ		
T 802	RT-4105-1		000-734-105	
T 803	RT-4105-1		000-734-105	

変調トリガー基板 MODULATOR TRIGGER BOARD 03P5732 (参照図番: C3307-013-E / REF. DWG. NO. : C3307-016-E)

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	CAPACITOR	ｺﾝﾃﾞﾝｻｰ		
C 809	MD-2-2E-105M	1UF 250WV	000-262-195	
C 810	MD-2-2E-105M	1UF 250WV	000-262-195	
C 826	ECE-A1CU101E	100UF 16V	000-206-112	
C 850	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 851	ECE-A1CU101E	100UF 16V	000-206-112	
C 852	ECE-A1CU101E	100UF 16V	000-206-112	
C 853	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 854	RPE122CH101J50	100PF 50V	000-251-859	
C 855	RPE122CH331J50	330PF 50V	000-251-854	
C 856	ECQ-M1H223KVW	0.022UF 50V	000-260-414	
C 857	ECQ-M1H472KVW	4700PF, 50V	000-260-421	
C 860	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 861	ECE-A1CU101E	100UF 16V	000-206-112	
C 862	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 863	ECE-A1CU101E	100UF 16V	000-206-112	
C 864	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 865	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 866	ECQ-M1H222KVW	2200PF 50V	000-260-419	
C 880	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 881	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 883	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 884	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 885	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 886	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
	DIODE	ﾀﾞｲｵｰﾄﾞ		
CR 850	1S1588		000-112-795	
CR 851	1S1588		000-112-795	
CR 854	1S1588		000-112-795	
CR 880	1S1588		000-112-795	
	JACK	ｼﾞｬｯｸ		
J 801	LR-15		000-505-475	
	SLM-01T-2.0		000-505-392	12 PCS.
J 803	B3P-VH	3P	000-505-821	
J 804	B3P-SHF-1AA	3P	000-505-551	
J 805	B9P-VH	9P	000-505-827	
J 816	SMR-02V-B,2P		000-505-367	
	SYM-001T-0.6		000-505-360	2 PCS.
	TRANSISTOR	ﾄﾗﾝｼﾞｽﾀｰ		
Q 850	2SC752GTM-0		000-124-129	
Q 853	2SA715C		000-117-430	
Q 854	2SC752GTM-0		000-124-129	
Q 880	2SC367GTM-0		000-123-552	
Q 881	2SC367GTM-0		000-123-552	
Q 882	2SC367GTM-0		000-123-552	
Q 884	2SC367GTM-0		000-123-552	
	RESISTOR	ﾃｲｺｳ		
R 850	ERD-25PJ101	0.25W 100	000-330-333	
R 851	ERD-25PJ101	0.25W 100	000-330-333	
R 852	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 853	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 854	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 855	ERD-25TJ103	0.25W 10K	000-330-381	
R 856	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 857	ERD-25TJ103	0.25W 10K	000-330-381	
R 858	ERD-25TJ333	0.25W 33K	000-330-393	
R 859	ERD-25TJ563	0.25W 56K	000-330-399	

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
R 860	ERD-25PJ473	0.25W 47K	000-330-397	
R 861	ERD-25TJ103	0.25W 10K	000-330-381	
R 865	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 866	ERD-25PJ101	0.25W 100	000-330-333	
R 868	ERD-25TJ681	0.25W 680	000-330-353	
R 869	ERD-25PJ100	0.25W 10	000-330-309	
R 870	ERD-25PJ270	0.25W 27	000-330-319	
R 871	ERD-25PJ4R7	0.25W 4.7	000-330-301	
R 872	ERD-25PJ4R7	0.25W 4.7	000-330-301	
R 873	ERD-25PJ473	0.25W 47K	000-330-397	
R 875	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 876	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 877	ERD-25PJ470	0.25W 47	000-330-325	
R 880	ERD-25TJ103	0.25W 10K	000-330-381	
R 881	ERD-25TJ103	0.25W 10K	000-330-381	
R 882	ERD-25TJ103	0.25W 10K	000-330-381	
R 883	ERD-25TJ103	0.25W 10K	000-330-381	
R 884	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 885	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 886	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 887	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 888	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 889	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 890	ERD-25PJ224	0.25W 220K	000-330-413	
R 891	ERD-25TJ333	0.25W 33K	000-330-393	
R 893	ERD-25PJ823	0.25W 82K	000-330-403	
R 894	ERD-25PJ823	0.25W 82K	000-330-403	
R 896	ERD-25PJ101	0.25W 100	000-330-333	
R 897	ERD-25TJ103	0.25W 10K	000-330-381	
	INTEGRATED CIRCUIT	ｼｭｳｾｷｶｲﾛ		
U 850	TC4538BP		000-163-907	
U 852	TC4049BP		000-163-255	
U 853	TC4011BP		000-163-245	

変調トリガー基板 MODULATOR TRIGGER BOARD RF-5144 (参照図番: C3307-015-D / REF. DWG. NO. : C3307-017-C)

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	CAPACITOR	ｺﾝﾃﾞﾝｻｰ		
C 809	MD-2-2E-105M	1UF 250WV	000-262-195	
C 810	MD-2-2E-105M	1UF 250WV	000-262-195	
C 826	ECE-A1CS101	100UF 16V	000-201-427	
C 850	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 851	ECE-A1CS101	100UF 16V	000-201-427	
C 852	ECE-A1CS101	100UF 16V	000-201-427	
C 853	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 854	RPE110CH101J50	100PF, 50V	000-251-700	
C 855	RPE110CH331J50	330PF, 50V	000-251-702	
C 856	ECQ-M1H223JZ	0.022UF	000-260-454	
C 857	ECQ-M1H472KV	4700PF 50V	000-260-209	
C 860	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 861	ECE-A1CS101	100UF 16V	000-201-427	
C 862	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 863	ECE-A1CS101	100UF 16V	000-201-427	
C 864	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 865	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 866	ECQ-M1H222KV	2200PF 50V	000-260-205	
C 880	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 881	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 882	ECE-A25V4R7T	4.7UF 25V	000-201-160	
C 883	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 884	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 885	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
C 886	FK20Y5V1H104Z	0.1UF 50V	000-254-900	
	DIODE	ﾀﾞｲｵｰﾄﾞ		
CR 803	DFG-1B8	13-3-5073	000-136-013	
CR 850	1S1588		000-112-795	
CR 851	1S1588		000-112-795	
CR 854	1S1588		000-112-795	
	JACK	ｼﾞｬｯｸ		
J 801	LR-15		000-505-475	
	SLM-01T-2.0		000-505-392	12 PCS.
J 803	B3P-VH	3P	000-505-821	
J 804	B3P-SHF-1AA	3P	000-505-551	
J 805	B4P-VH	4P	000-505-822	
J 807	B2P-VH	2P	000-505-820	
J 808	B6P-SHF-1AA	6P	000-505-554	

NOTE:
備 考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	RELAY	リレー		
K 804	MR31-12D		000-454-079	
	TRANSISTOR	トランジスター		
Q 812	2SC367GTM-0		000-123-552	
Q 850	2SC752GTM-0		000-124-129	
Q 853	2SA715C		000-117-430	
Q 854	2SC752GTM-0		000-124-129	
Q 880	2SC367GTM-0		000-123-552	
Q 881	2SC367GTM-0		000-123-552	
Q 882	2SC367GTM-0		000-123-552	
Q 884	2SC367GTM-0		000-123-552	
	RESISTOR	テイコウ		
R 850	ERD-25PJ101	0.25W 100	000-330-333	
R 851	ERD-25PJ101	0.25W 100	000-330-333	
R 852	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 853	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 854	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 855	ERD-25TJ103	0.25W 10K	000-330-381	
R 856	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 857	ERD-25TJ103	0.25W 10K	000-330-381	
R 858	ERD-25PJ393	0.25W 39K	000-330-395	
R 859	ERD-25TJ563	0.25W 56K	000-330-399	
R 860	ERD-25PJ473	0.25W 47K	000-330-397	
R 861	ERD-25TJ103	0.25W 10K	000-330-381	
R 865	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 866	ERD-25PJ101	0.25W 100	000-330-333	
R 868	ERD-25TJ681	0.25W 680	000-330-353	
R 869	ERD-25PJ100	0.25W 10	000-330-309	
R 870	ERD-25PJ270	0.25W 27	000-330-319	
R 871	ERD-25PJ4R7	0.25W 4.7	000-330-301	
R 872	ERD-25PJ4R7	0.25W 4.7	000-330-301	
R 873	ERD-25PJ473	0.25W 47K	000-330-397	
R 875	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 876	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 877	ERD-25PJ470	0.25W 47	000-330-325	
R 880	ERD-25TJ103	0.25W 10K	000-330-381	
R 881	ERD-25TJ103	0.25W 10K	000-330-381	
R 882	ERD-25TJ103	0.25W 10K	000-330-381	
R 883	ERD-25TJ103	0.25W 10K	000-330-381	
R 884	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 885	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 886	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 887	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 888	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 889	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 890	ERD-25PJ823	0.25W 82K	000-330-403	
R 892	ERD-25PJ223	0.25W 22K	000-330-389	
R 893	ERD-25PJ823	0.25W 82K	000-330-403	
R 894	ERD-25PJ823	0.25W 82K	000-330-403	
R 895	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 896	ERD-25PJ101	0.25W 100	000-330-333	
R 897	ERD-25TJ103	0.25W 10K	000-330-381	
	INTEGRATED CIRCUIT	シユウセキカイロ		
U 850	TC4538BP		000-163-907	
U 851	TC4538BP		000-163-907	
U 852	TC4049BP		000-163-255	
U 853	TC4011BP		000-163-245	

I F アンプ基板 IF AMP. BOARD BIF-4879 (参照図番: REF. DWG. NO. : C3307-026-D)

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	CAPACITOR	コンデンサー		
C 601	DD109E103P50V02	0.01UF	000-252-436	
C 602	DD109E103P50V02	0.01UF	000-252-436	
C 603	ECE-A1CS101	100UF 16V	000-201-427	
C 604	DD104B102K50V	1000PF 50V	000-252-171	
C 606	DD109E103P50V02	0.01UF	000-252-436	
C 607	ECC-F1H150JC	15PF 50V	000-256-902	
C 608	DD109E103P50V02	0.01UF	000-252-436	
C 609	DD109E103P50V02	0.01UF	000-252-436	
C 610	DD109E103P50V02	0.01UF	000-252-436	
C 611	DD109E103P50V02	0.01UF	000-252-436	
C 612	DD109E103P50V02	0.01UF	000-252-436	
C 613	DD109E103P50V02	0.01UF	000-252-436	
C 614	DD109E103P50V02	0.01UF	000-252-436	
C 616	DD104B102K50V	1000PF 50V	000-252-171	
C 617	DD109E103P50V02	0.01UF	000-252-436	
C 619	DD109E103P50V02	0.01UF	000-252-436	
C 621	DD109E103P50V02	0.01UF	000-252-436	
C 622	ECC-F1H150JC	15PF 50V	000-256-902	
C 623	DD104B102K50V	1000PF 50V	000-252-171	
C 624	ECE-A1CS101	100UF 16V	000-201-427	
C 625	DD109E103P50V02	0.01UF	000-252-436	
C 626	ECC-F1H220JC	22PF 50V	000-256-905	
C 627	DD109E103P50V02	0.01UF	000-252-436	
C 628	DD109E103P50V02	0.01UF	000-252-436	
C 629	DD109E103P50V02	0.01UF	000-252-436	
C 630	ECE-A1CS101	100UF 16V	000-201-427	
C 631	DD109E103P50V02	0.01UF	000-252-436	
C 632	DD109E103P50V02	0.01UF	000-252-436	
C 633	DD104B102K50V	1000PF 50V	000-252-171	
C 634	DD104B102K50V	1000PF 50V	000-252-171	
C 635	DD104B102K50V	1000PF 50V	000-252-171	
C 636	MD2-2A-104M	0.1UF 100V	000-262-369	
C 638	DD104B102K50V	1000PF 50V	000-252-171	
C 639	ECQ-M1H334KZ	0.33UF 50V	000-260-389	
C 640	DD109E103P50V02	0.01UF	000-252-436	
C 641	ECE-A1CS100	10UF 16V	000-201-423	
C 642	DD104B102K50V	1000PF 50V	000-252-171	
C 643	DD104B102K50V	1000PF 50V	000-252-171	
C 648	ECC-F1H270JC	27PF 50VDC	000-255-220	
	DIODE	ダイオード		
CR 601	MI-301		000-133-699	
CR 603	1S1588		000-112-795	
CR 604	1S1588		000-112-795	
CR 605	1S1588		000-112-795	
CR 606	1S1588		000-112-795	
CR 607	RD6.8FB	ZENER	000-134-800	
CR 608	RD22EB	ZENER	000-134-840	
CR 609	RD22EB	ZENER	000-134-840	
CR 610	MI-301		000-133-699	
	JACK	ジヤツク		
J 608	B6P-SHF-1AA	6P	000-505-554	
	COIL	コイル		
L 601	RL-5977	03S5977	000-100-977	
L 602	EL0810-102K	1MH 50MA	000-427-670	
L 603	EL0710-5R6K00S0037	5.6UH 270MA	000-427-625	
L 604	EL0710-5R6K00S0037	5.6UH 270MA	000-427-625	
	PLUG	プラグ		
P 604	H8P-SHF-AA,8P	NH HOUSING	000-505-601	
	SHF-001T-08S		000-505-301	8PCS.
P 605	LDF-0.1T-1.3AS		000-538-143	
	111823		000-568-850	
P 607	LDF-0.1T-1.3AS		000-538-143	
	111823		000-568-850	
	TRANSISTOR	トランジスター		
Q 601	2SC606(B)T		000-123-915	
Q 602	2SC606(B)T		000-123-915	
Q 603	2SA495GTM-Y		000-116-993	
Q 604	2SC372GTM-Y		000-123-561	
Q 605	2SA495GTM-Y		000-116-993	
Q 606	2SK11-Y		000-129-222	
	RESISTOR	テイコウ		
R 601	ERD-25PJ152	0.25W 1.5K	000-330-361	
R 602	ERD-25PJ392	0.25W 3.9K	000-330-371	
R 603	ERD-25PJ331	0.25W 330	000-330-345	
R 604	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 605	ERD-25PJ101	0.25W 100	000-330-333	
R 607	ERD-25PJ153	0.25W 15K	000-330-385	
R 608	ERD-25PJ471	0.25W 470	000-330-349	
R 609	ERD-25PJ101	0.25W 100	000-330-333	
R 610	ERD-25PJ153	0.25W 15K	000-330-385	
R 611	ERD-25PJ101	0.25W 100	000-330-333	
R 612	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 615	ERD-25PJ473	0.25W 47K	000-330-397	
R 616	ERD-25PJ220	0.25W 22	000-330-317	
R 617	ERD-25TJ103	0.25W 10K	000-330-381	
R 618	ERD-25PJ471	0.25W 470	000-330-349	
R 619	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 620	ERD-25PJ100	0.25W 10	000-330-309	
R 621	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 622	ERD-25PJ220	0.25W 22	000-330-317	
R 623	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 624	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 625	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 626	ERD-25PJ682	0.25W 6.8K	000-330-377	
R 627	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 628	ERC-12GK106	0.5W 10M	000-340-881	
R 629	ERD-25PJ472	0.25W 4.7K	000-330-373	

NOTE:
備 考:

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
R 630	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 631	ERD-25PJ100	0.25W 10	000-330-309	
R 632	ERG-1ANJ390	1W 39	000-371-227	
R 633	ERD-25PJ223	0.25W 22K	000-330-389	
R 638	ERD-25PJ471	0.25W 470	000-330-349	
R 639	ERD-25PJ101	0.25W 100	000-330-333	
R 640	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 641	ERD-25PJ221	0.25W 220	000-330-341	
R 642	ERD-25PJ122	0.25W 1.2K	000-330-359	
	TRANSFORMER	トランス		
T 601	RT-5913	03S5913-0	000-100-978	
T 602	RT-5914	03S5914-0	000-100-979	
T 603	RT-5915	03S5915-0	000-100-980	
T 604	RT-5916	03S5916-0	000-100-981	
T 605	RT-5917	03S5917-0	000-100-982	
	TEST POINT	テストポイント		
TP 601	LC-2-S-YELLOW		000-537-970	
TP 602	LC-2-S-YELLOW		000-537-970	
	INTEGRATED CIRCUIT	シユウセキカイロ		
U 601	MC1590G		000-169-027	
U 602	MC1590G		000-169-027	
U 603	M5186P		000-150-284	
U 604	MC1330A1P		000-169-447	
U 605	TA78L005AP		000-163-606	
	POTENTIOMETER	ポテンショメーター		
VR 601	PK502H202H0	20K,B	000-109-998	

IF アンプ基板 BIF-5668 (参照図番: C3307-014-D)
IF AMP. BOARD (REF. DWG. NO. : C3307-014-D)

SYMBOL 記 号	TYPE 型 名	SPECIFICATIONS 規 格	CODE NO. コード番号	REMARKS 備 考
	CAPACITOR	コンデンサー		
C 601	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 603	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 604	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 605	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 606	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 607	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 608	RPE132CH471J50	470PF 50V	000-104-903	
C 609	ECE-A1CU100E	10UF 16V	000-201-672	
C 610	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 611	RPE122CH101J50	100PF 50V	000-251-859	
C 612	ECC-W1H150JC5	15PF 50V	000-256-405	
C 613	ECC-W1H330JR5	W5.0 33PF 50V	000-256-441	
C 614	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 615	ECE-A1CU100E	10UF 16V	000-201-672	
C 616	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 617	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 618	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 619	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 620	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 621	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 622	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 623	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 624	ECC-W1H060DC5	6PF 50V	000-256-415	
C 625	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 626	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 627	ECE-A1CU100E	10UF 16V	000-201-672	
C 628	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 629	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 630	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 631	ECC-W1H060DC5	6PF 50V	000-256-415	
C 632	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 633	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 634	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 635	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 636	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 637	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 638	ECC-W1H060DC5	6PF 50V	000-256-415	
C 639	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 640	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 641	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 642	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 643	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 644	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 645	ECC-W1H060DC5	6PF 50V	000-256-415	
C 646	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 647	ECE-A1CU100E	10UF 16V	000-201-672	
C 648	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 649	ECE-A1CU101E	100UF 16V	000-206-112	
C 651	ECE-A1CU100E	10UF 16V	000-201-672	
C 653	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 654	ECE-A1CU101E	100UF 16V	000-206-112	
C 655	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 656	ECE-A1CU101E	100UF 16V	000-206-112	
C 657	ECE-A1CU101E	100UF 16V	000-206-112	
C 658	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 659	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 660	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 661	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 662	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 663	ECC-W1H020CC5	2PF 50V	000-256-413	
C 664	CC165CH1H470J	47PF 50V	000-287-103	
C 665	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 666	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 667	CC165CH1H300J	30PF 50V	000-287-101	
C 668	RPE132F104Z50	0.1UF 50V	000-104-501	
C 669	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 670	RPE113C224M50	0.22UF 50V	000-251-763	
C 671	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 672	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 673	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 674	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 675	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 676	ECE-A1HN010S	1UF 50V	000-201-634	
C 677	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 678	DD104-69B102K50V	0.001UF 50V	000-253-806	
	DIODE	ダイオード		
CR 601	MI-301		000-133-699	
CR 602	MI-301		000-133-699	
CR 603	1S1588		000-112-795	
CR 604	1S1588		000-112-795	
CR 605	1S1588		000-112-795	
CR 607	1S1588		000-112-795	
CR 608	MA27W-B		000-133-733	
CR 610	RD6.8FB	ZENER	000-134-800	
CR 611	RD39EB	ZENER	000-134-862	
CR 613	MI-301		000-133-699	
CR 614	RD3.6EB	ZENER	000-134-803	
CR 615	1S1588		000-112-795	
CR 616	1S1588		000-112-795	
	JACK	ジャック		
J 605	B6P-SHF-1AA	6P	000-505-554	
J 608	SMR-04V-B,4P	SMR HOUSING	000-505-372	
	LYM-001T-0.6		000-505-487	4PCS.
	COIL	コイル		
L 602	EL0710-360K	36UH 205MA	000-427-630	
L 604	EL0710-360K	36UH 205MA	000-427-630	
L 605	EL0710-360K	36UH 205MA	000-427-630	
L 606	EL0810SKI-102K	1MH, 50MA	000-427-669	
L 607	EL0710-360K	36UH 205MA	000-427-630	
L 608	EL0710-360K	36UH 205MA	000-427-630	
L 609	EL0710-360K	36UH 205MA	000-427-630	
L 610	SP0406-R82K	0.82UH	000-429-264	
	PLUG	プラグ		
P 604	H8P-SHF-AA,8P	NH HOUSING	000-505-601	
	LHF-001T-0.8BS		000-505-504	8PCS.
	TRANSISTOR	トランジスター		
Q 601	2SC606(B)T		000-123-915	
Q 602	2SC606(B)T		000-123-915	
Q 603	2SC606(B)T		000-123-915	
Q 604	2SC606(B)T		000-123-915	
Q 606	2SK11-Y		000-129-222	
	RESISTOR	テイコウ		
R 602	ERD-25PJ470	0.25W 47	000-330-325	
R 603	ERD-25PJ100	0.25W 10	000-330-309	
R 604	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 605	ERD-25PJ392	0.25W 3.9K	000-330-371	
R 606	ERD-25PJ682	0.25W 6.8K	000-330-377	
R 608	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 609	ERD-25PJ152	0.25W 1.5K	000-330-361	
R 610	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 611	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 612	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 613	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 614	ERD-25PJ100	0.25W 10	000-330-309	
R 615	ERD-25PJ272	0.25W 2.7K	000-330-367	
R 616	ERD-25PJ821	0.25W 820	000-330-355	
R 617	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 618	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 619	ERD-25PJ272	0.25W 2.7K	000-330-367	

NOTE:
備 考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
R 620	ERD-25PJ100	0.25W 10	000-330-309	
R 621	ERD-25PJ821	0.25W 820	000-330-355	
R 622	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 623	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 624	ERD-25PJ272	0.25W 2.7K	000-330-367	
R 625	ERD-25PJ100	0.25W 10	000-330-309	
R 626	ERD-25PJ821	0.25W 820	000-330-355	
R 627	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 628	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 629	ERD-25PJ272	0.25W 2.7K	000-330-367	
R 630	ERD-25PJ100	0.25W 10	000-330-309	
R 631	ERD-25PJ821	0.25W 820	000-330-355	
R 632	ERD-25TJ333	0.25W 33K	000-330-393	
R 633	ERD-25PJ150	0.25W 15	000-330-313	
R 634	ERD-25PJ272	0.25W 2.7K	000-330-367	
R 635	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 637	ERD-25PJ153	0.25W 15K	000-330-385	
R 638	ERD-25PJ223	0.25W 22K	000-330-389	
R 639	ERD-25PJ471	0.25W 470	000-330-349	
R 640	ERD-25PJ270	0.25W 27	000-330-319	
R 641	ERD-25PJ101	0.25W 100	000-330-333	
R 642	ERD-25PJ100	0.25W 10	000-330-309	
R 643	ERD-25PJ100	0.25W 10	000-330-309	
R 644	ERD-25PJ100	0.25W 10	000-330-309	
R 645	ERD-25PJ100	0.25W 10	000-330-309	
R 646	ERD-25PJ100	0.25W 10	000-330-309	
R 647	ERD-25PJ101	0.25W 100	000-330-333	
R 648	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 649	ERD-25PJ562	0.25W 5.6K	000-330-375	
R 650	ERD-25PJ183	0.25W 18K	000-330-387	
R 651	ERD-25PJ221	0.25W 220	000-330-341	
R 652	ERD-25PJ221	0.25W 220	000-330-341	
R 653	ERD-25PJ152	0.25W 1.5K	000-330-361	
R 654	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 655	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 656	ERD-25PJ682	0.25W 6.8K	000-330-377	
R 657	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 658	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 659	ERC-12GK106	0.5W 10M	000-340-881	
R 660	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 661	ERD-25PJ392	0.25W 3.9K	000-330-371	
R 662	ERD-25PJ470	0.25W 47	000-330-325	
R 663	ERD-25PJ470	0.25W 47	000-330-325	
R 664	ERD-25PJ471	0.25W 470	000-330-349	
R 666	ERG-1SJ390P	1W 39	000-375-391	
R 667	ERD-25TJ103	0.25W 10K	000-330-381	
R 668	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 669	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 670	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 671	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 672	ERD-25PJ220	0.25W 22	000-330-317	
R 673	ERD-25PJ122	0.25W 1.2K	000-330-359	
R 675	ERD-25PJ470	0.25W 47	000-330-325	
R 676	ERD-25PJ101	0.25W 100	000-330-333	
	TRANSFORMER	ﾄﾗﾝｽ		
T 601	RT-5678	03S5678	000-100-072	
T 602	RT-5679	03S5679	000-100-073	
T 603	RT-5680	03S5680	000-100-074	
T 604	RT-5680	03S5680	000-100-074	
T 605	RT-5680	03S5680	000-100-074	
T 606	RT-5681	03S5681	000-100-726	
T 607	RT-5335-1	13-3-5335-1	000-424-506	
T 608	RT-5336	13-3-5336	000-424-507	
	TEST POINT	ﾃｽﾄﾎﾟｲﾝﾄ		
TP 601	LC-2-S-YELLOW		000-537-970	
TP 602	LC-2-S-YELLOW		000-537-970	
	INTEGRATED CIRCUIT	ｼﾕｳｾｷｶｲﾛ		
U 601	CA3028AT SELECTED		000-101-559	
U 602	CA3028AT SELECTED		000-101-559	
U 603	CA3028AT SELECTED		000-101-559	
U 604	CA3028AT SELECTED		000-101-559	
U 605	MC1350		000-169-454	
U 606	MC1330A1P		000-169-447	
U 607	TA78L005AP		000-163-606	
	POTENTIOMETER	ﾎﾟﾃﾝｼﾖﾒｰﾀｰ		
VR 601	EVM-MCGA01B52	00S0119-1	000-103-592	
VR 602	EVM-MCGA01B24	20K (00S0119)	000-103-591	

STC基板 STC BOARD ASTC-6995 BSTC-6995 (参照図番: REF. DWG. NO. : C3307-011-C)

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	CAPACITOR	ｺﾝﾃﾞﾝｻｰ		
C 701	ECE-A1CU100E	10UF 16V	000-201-672	
C 702	ECE-A1CU101E	100UF 16V	000-206-112	
C 703	RPE132F104Z50	0.1UF 50V	000-104-501	
C 704	ECE-A1CU100E	10UF 16V	000-201-672	
C 705	ECE-A1CU101E	100UF 16V	000-206-112	
C 706	RPE132F104Z50	0.1UF 50V	000-104-501	
C 707	ECQ-M1H223KVW	0.022UF 50V	000-260-414	
C 709	ECQ-M1H223KVW	0.022UF 50V	000-260-414	
C 710	ECQ-M1H183KVW	0.018UF 50V	000-260-473	
C 711	ECQ-M1H822KVW	8200PF 50V	000-260-471	DA TYPE
	ECQ-MIH332KVW	3300PF 50V	000-260-413	D TYPE
C 712	ECQ-M1H103KVW	0.01UF 50V	000-260-416	
C 714	ECE-A1CU100E	10UF 16V	000-201-672	
C 715	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 716	RPE132F104Z50	0.1UF 50V	000-104-501	
C 717	RPE132F104Z50	0.1UF 50V	000-104-501	
C 718	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 719	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 720	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 721	RPE132CH331J50	330PF 50V	000-105-389	
C 722	RPE132F104Z50	0.1UF 50V	000-104-501	
C 723	DD104-69B102K50V	0.001UF 50V	000-253-806	
C 724	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 725	RPE132F104Z50	0.1UF 50V	000-104-501	
C 727	ECQ-M1H182KV	1800PF 50V	000-260-204	
	DIODE	ﾀﾞｲｵｰﾄﾞ		
CR 701	05AZ5.1X	ZENER	000-104-418	
CR 703	1S1588		000-112-795	
	JACK	ｼﾞﾔﾂｸ		
J 601	LR-12		000-505-473	
	LLM-01T-2.0		000-505-494	12PCS.
J 604	BS8P-SHF-1AA-K	13-3-3809-1	000-100-606	
	MISCELLANEOUS	ｿﾉﾀ		
JP 701	JPW02		000-567-703	
JP 702	JPW02		000-567-703	
	COIL	ｺｲﾙ		
L 701	EL0710-360K	36UH 205MA	000-427-630	
L 702	EL0710-360K	36UH 205MA	000-427-630	
	PLUG	ﾌﾟﾗｸﾞ		
P 602	LDF-0.1T-1.3AS		000-538-143	
	111823		000-568-850	
P 603	LDF-0.1T-1.3AS		000-538-143	
	111823		000-568-850	
P 608	SMP-04V-BC 4P		000-505-377	DA TYPE
	LHF-001T-0.8BS		000-505-504	D TYPE
P 611	SMF01T-1.3		000-505-396	
P 612	SMF01T-1.3		000-505-396	DA TYPE
P 613	SMF01T-1.3		000-505-396	D TYPE
P 816	SMP-02V-BC 2P		000-505-374	
	LHF-001T-0.8BS		000-505-504	2PCS.
	TRANSISTOR	ﾄﾗﾝｼﾞｽﾀｰ		
Q 701	2SC1815-Y		000-125-631	
Q 702	2SC1815-Y		000-125-631	
Q 703	2SC752GTM-O		000-124-129	
Q 704	2SA495GTM-O		000-116-992	
	RESISTOR	ﾃｲｺｳ		
R 701	ERD-25PJ560	0.25W 56	000-330-327	DA TYPE
	ERD-25PJ680	0.25W 68	000-330-329	D TYPE
R 702	ERD-25PJ560	0.25W 56	000-330-327	DA TYPE
	ERD-25PJ270	0.25W 27	000-330-319	D TYPE
R 703	ERD-25PJ223	0.25W 22K	000-330-389	
R 704	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 705	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 706	ERD-25PJ123	0.25W 12K	000-330-383	
R 707	ERD-25PJ331	0.25W 330	000-330-345	
R 709	ERD-25PJ682	0.25W 6.8K	000-330-377	
	ERD-25PJ822	0.25W 8.2K	000-330-379	
R 710	ERD-25PJ822	0.25W 8.2K	000-330-379	
R 711	ERD-25PJ102	0.25W 1.0K	000-330-357	DA TYPE
	ERD-25PJ182	0.25W 1.8K	000-330-363	D TYPE
R 712	ERD-25TJ333	0.25W 33K	000-330-393	
R 715	ERD-25PJ223	0.25W 22K	000-330-389	D TYPE

NOTE:
備考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
R 716	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 717	ERD-25PJ153	0.25W 15K	000-330-385	
R 718	ERD-25PJ682V	A-B1.0K	000-330-713	
R 719	ERD-25PJ272	0.25W 2.7K	000-330-367	
R 720	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 721	ERD-25PJ220	0.25W 22	000-330-317	DA TYPE
	ERD-25PJ330	0.25W 33	000-330-321	D TYPE
R 722	ERD-25PJ223	0.25W 22K	000-330-389	DA TYPE
R 723	ERD-25PJ223	0.25W 22K	000-330-389	
R 724	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 725	ERD-25TJ103	0.25W 10K	000-330-381	
R 726	ERD-25PJ821	0.25W 820	000-330-355	
R 727	ERD-25PJ220	0.25W 22	000-330-317	
	THERMISTOR	サーミスター		
RT 701	D-22A		000-180-617	
	TEST POINT	テストホ゜イント		
TP 701	LC-2-S-YELLOW		000-537-970	
TP 702	LC-2-S-YELLOW		000-537-970	
TP 703	LC-2-S-YELLOW		000-537-970	
TP 704	LC-2-S-YELLOW		000-537-970	
TP 705	LC-2-S-BLACK		000-537-971	
	INTEGRATED CIRCUIT	シユウセキカイロ		
U 701	RC-6373-1	03S6373-1	000-106-864	
	POTENTIOMETER	ホ゜テンシヨメーター		
VR 701	EVM-MWGA01B24	00S0119-1,20K	000-103-650	

方位パルス発生基板
BEARING SIGNAL GENERATOR BOARD MP-3795
(参照図番：
REF.DWG. NO. : C3307-013-E
C3307-015-D
C3307-016-E
C3307-017-C)

	CAPACITOR	コンデ゛ンサー		
C 901	ECE-A1CS101	100UF 16V	000-201-427	
C 902	DD109E103P50V	0.01UF 50V	000-253-436	
C 903	ECQ-M1H103KZ	0.01UF 50V	000-260-370	
C 904	ECE-A1CS100	10UF 16V	000-201-423	
C 905	ECQ-M1H104KZ	0.1UF 50V	000-260-390	
	JACK	シ゛ャツク		
J 901	B5P-SHF-1AA	5P	000-505-553	
J 902	B2P-SHF-1AA	2P	000-505-550	
	TRANSISTOR	トランシ゛スター		
Q 901	2SA495GTM-O		000-116-992	
Q 902	2SC367GTM-O		000-123-552	
	RESISTOR	テイコウ		
R 901	ERD-25PJ561	0.25W 560	000-330-351	
R 902	ERD-25PJ100	0.25W 10	000-330-309	
R 903	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 904	ERD-25PJ222	0.25W 2.2K	000-330-365	
R 905	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 906	ERD-25TJ333	0.25W 33K	000-330-393	
R 907	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 908	ERD-25PJ472	0.25W 4.7K	000-330-373	
R 909	ERD-25TJ103	0.25W 10K	000-330-381	
R 910	ERD-25PJ102	0.25W 1.0K	000-330-357	
R 911	ERD-25PJ391	0.25W 390	000-330-347	
R 912	ERD-25PJ391	0.25W 390	000-330-347	
R 913	ERD-25PJ391	0.25W 390	000-330-347	
R 914	ERD-25PJ391	0.25W 390	000-330-347	
R 915	ERD-25PJ101	0.25W 100	000-330-333	
R 921	ERD-25PJ331	0.25W 330	000-330-345	
	INTEGRATED CIRCUIT	シユウセキカイロ		
U 901	ON-1102		000-134-100	
U 902	HA17902G		000-162-081	

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考

NOTE:
備考:

SYMBOL	PARTS NAME	TYPE／DWG. NO.	CODE NO.	REMARKS
記 号	部 品 名	型 名／図 番	コード番号	備 考

Refer to the mechanical parts exploded view (DWG. NO. : C3307-032-A).

A 00201	COVER	03-024-1011	100-072-002	
A 00202	FRONT CHASSIS	03-024-1111	100-072-103	
A 00203	LEFT CHASSIS	03-024-1113	100-072-124	
A 00204	RIGHT CHASSIS	03-024-1112	100-072-114	
A 00205	REAR CHASSIS	03-024-1114	100-072-134	
A 00206	BOTTOM PLATE	03-024-1002	100-071-973	
A 00207	FIXING ANGLE	03-024-1003	100-071-982	
A 00208	STOPPER PLATE	03-024-1004	100-071-991	
A 00209	MOUNTING SADDLE	03-071-962	100-071-962	
A 00210	REAR COVER	03-024-1102	100-072-082	
A 00211	CABLE CLAMP FIXING PLATE	03-024-1101	100-072-073	
A 00212	CABLE CLAMP	03-001-1115	300-111-151	
A 00213	CABLE CLAMP SUPPORTER (2)	14-011-2039	841-120-391	
A 00214	CLAMP PLATE	03-001-1116	300-111-160	
A 00215	FRONT PANEL	03-024-1201	100-072-181	
A 00216	PACKING FOR CRT	03-024-1204	100-072-211	
A 00217	PACKING FOR KEYBOARD	03-024-1205	100-072-220	
A 00218	RUBBER BUSH (1)	03-004-1222	300-412-220	2PCS.
A 00219	KNOB	020-4420	000-515-303	2PCS.
A 00220	KNOB CAP	040-4020	000-515-324	2PCS.
A 00221	PACKING FOR PRESET COVER	03-024-1206	100-072-230	
A 00222	PRESET COVER	03-024-1202	100-072-190	
A 00223	RUBBER BUSH (1)	03-004-1222	300-412-220	6PCS.
A 00224	KNOB *SINGLE*	03-004-1064	300-410-640	6PCS.
A 00225	FILTER THUMBSCREW	02-043-1323	204-313-230	2PCS.
A 00226	E-TYPE CIRCLIP	ETW-2.3 SUS304	000-866-705	2PCS.
A 00227	KNOB	1915313	000-110-484	
A 00228	KNOB CAP	3015003	000-110-485	
A 00229	HANDLE	03-001-1215	300-112-153	2PCS.
A 00230	ROSETTE WASHER	M6 C2700W	000-864-910	4PCS.
A 00231	HOOD	03-024-1607	100-072-310	
A 00232	NON-GLARE FILTER	03-024-1701	100-072-332	
A 00233	HOOD FIXING SCREW	03-016-1602	100-030-170	
A 00234	GROMMET	NG-79-D	000-871-205	
A 00235	COSMETIC SCREW	M4X10	000-861-890	6PCS.
A 00236	SPACER(2)	HSA-3010	000-803-010	3PCS.
A 00237	(GS) STICKER	03-024-9001	100-074-400	
A 00238	SHIELDING GUM	03-024-1213	100-072-260	
A 00239	MASKING SHEET	03-017-1215	100-056-381	
A 00240	EMBLEM	03-024-1211	100-072-240	
A 00241	VRM PANEL (E)	03-024-1223	100-072-290	
A 00242	EBL PANEL (E)	03-024-1224	100-072-300	
A 00243	LABEL.59.	RNA-1059	390-110-590	
A 00244	LABEL.14.	RND-1014	390-410-140	
A 00245	BLIND SHEET (2)	03-024-1214	100-072-531	FOR N TYPE
A 00246	STICKER (HIGH VOLTAGE)	R-12135D	390-100-010	
A 00247	LABEL (PRESET)	03-024-1057	100-074-410	
A 00248	BLIND SHEET (1)	03-024-1212	100-072-250	
A 00249	DOME SUPPORT WASHER	SHN-2081	661-420-810	
A 00250	MEMORY CARD SHUTTER (1)	03-024-9211	100-074-201	
	MEMORY CARD SHUTTER (2)	03-024-9212	100-074-211	
	SPRING FOR M-CARD DOOR (R)	03-024-9213	100-074-221	
	SPRING FOR M-CARD DOOR (L)	03-024-9214	100-074-230	
A 00251	SPACER (2)	HSA-3020	000-803-020	4PCS.
A 00252	SPACER	SQ-20	000-801-650	3PCS.
A 00253	PACKING FOR M-CARD SLOT	03-024-9202	100-074-190	
A 00254	VR PANEL (ENGLISH)	03-024-1222	100-072-281	FOR OUTSIDE JAPAN
	VR PANEL (J)	03-024-1221	100-072-272	FOR JAPAN
A 00255	LABEL (1)	03-024-1051	100-072-012	
A 00256	NAME PLATE	WNN-3007	520-430-070	

NOTE:

備 考:

Refer to the mechanical parts exploded view (DWG. NO. : C3276-012-B ---- FR-1505/1510D(A)).
Refer to the mechanical parts exploded view (DWG. NO. : C3290-005-B ---- FR-1525D(A)).

SYMBOL 記 号	PARTS NAME 部 品 名	TYPE／DWG. NO. 型名／図 番	CODE NO. コード番号	REMARKS 備 考
A 00101A	RADIATOR ASSEMBLY *4FT*	P12B-11 FOR S24/48	000-879-310	1.2M
	RADIATOR ASSEMBLY	XN3-B01	008-321-260	2.0M
	RADIATOR ASSY. (6.5FT)	XN-3A	008-324-530	2.0M
	RADIATOR ASSEMBLY	XN-4A	008-324-130	2.4M
A 00103	WAVEGUIDE CLAMP INSULATOR	RSB-2008-0	360-220-080	FOR 2.0M
A 00104A	FEEDER WAVEGUIDE ASSEMBLY	*6.5FT* XN3-B01	003-031-830	FOR XN
A 00105	W.G. CLAMP	RSB-2006-1	360-220-061	FOR 2.0M
A 00107A	ANTENNA RADIATOR ASSEMBLY	XN2-B00, 123CM	003-032-320	1.2M ANT & FEEDER WG
	ANTENNA RADIATOR ASSEMBLY	XN3-B01, 6.5FT	008-325-110	2.0M ANT & FEEDER WG
	ANTENNA RADIATOR ASSEMBLY	XN3A	008-324-500	2.0M ANT & FEEDER WG
	ANTENNA RADIATOR ASSEMBLY	XN4A	008-324-000	2.4M ANT & FEEDER WG
A 00108	FEEDER WAVEGUIDE	F12B-1	000-879-008	FOR 1.2M
A 00109A	ROTARY JOINT ASSEMBLY	C2P7N2N/8N2N	008-320-520	
A 00110	REED SWITCH MOUNT	RSK-2108-1	361-121-081	
A 00111	C-TYPE CIRCLIP	13MMDIA.NOMINAL SK5	000-866-504	
A 00114	MOTOR FIXING PLATE	03-001-3231-6	300-132-316	
A 00115	SCANNER COVER	03-001-3261-2	300-132-612	
A 00117	CABLE CLAMPING FLANGE	03-001-3213-1	300-132-131	
A 00118	WASHER FOR PACKING	FOR JISF8801 25C	000-870-209	
A 00119	WASHER FOR PACKING	FOR JISF8801 25C	000-870-209	
A 00120	CHAIN	ST-16	000-841-394	
A 00122	BEARING RETAINER RING	RSI-2001-0	360-920-010	
A 00123	RADIATOR BRACKET ASSEMBLY	03-001-3221-4	300-132-214	
A 00126	V-RING	VR-120A	000-850-738	
A 00127	SCANNER HOUSING	03-001-3212-1	300-132-121	
A 00128	SCANNER COVER	03-001-3261-0	300-132-610	FOR 5/10KW
	SCANNER COVER (2)	03-001-3281-0	300-132-810	FOR 25KW
A 00129	KEY	7 X 7 X 23	000-866-851	
A 00130	MAGNET	RP-1757 MS4X9X15	000-499-055	
A 00131	TURNING GEAR FLANGE	RSI-2002-1	360-920-021	
A 00132	GUIDE RAIL SHIM .1.	RSK-2402-1	361-124-021	2PCS
A 00133	GUIDE RAIL SHIM .2.	RSK-2403-1	361-124-031	2PCS
A 00134	SLIDE RAIL	RSK-2401-1	361-124-011	2PCS FOR 5/10KW
	SLIDE RAIL (2)	03-007-3251	300-732-510	2PCS 25KW
A 00135A	SLIDE RAIL ASSEMBLY	03-001-3250-0	300-132-500	2PCS FOR 5/10KW
A 00136	HELI-SERT	M8-1.25X1.5DNS	000-867-635	8PCS
A 00151	W.G. CLAMP	RSB-2006-1	360-220-061	FOR 2.4M
A 00152A	FEEDER WAVEGUIDE ASSEMBLY	03-007-4200-1	300-742-001	FOR XN-3A
	FEEDER WAVEGUIDE ASSY	03-003-4200-1	300-342-001	FOR XN-4A
A 00153	WAVEGUIDE CLAMP INSULATOR	03-003-4003-0	300-340-030	FOR 2.4M
A 00160	MOTOR FIXING PLATE GUIDE	03-001-3291-0	300-132-910	
A 00161	MOTOR END COVER	03-001-3236-0	300-132-360	
BG00101	BEARING	6013ZZ	000-873-268	
BG00102	BEARING	6013ZZ	000-873-268	
BT00105	HEX. WASHER HEAD BOLT (B)	M4 X 16 SUS 304	000-882-042	4PCS
BT00106	HEX. WASHER HEAD BOLT (B)	M4 X 16 SUS 304	000-882-042	8PCS
BT00107	HEX.WASHER HEAD BOLT (B)	M4 X 25 SUS 304	000-882-043	2PCS
BT00108	HEX. WASHER HEAD BOLT (B)	M4 X 16 SUS 304	000-882-042	4PCS
BT00109	HEX. WASHER HEAD BOLT (B)	M4 X 16 SUS 304	000-882-042	4PCS

NOTE:
備 考:

Refer to the mechanical parts exploded view (DWG. NO. : C3276-012-B ---- FR-1505/1510D(A)).

Refer to the mechanical parts exploded view (DWG. NO. : C3290-005-B ---- FR-1525D(A)).

SYMBOL 記 号	PARTS NAME 部 品 名	TYPE／DWG. NO. 型名／図 番	CODE NO. コード番号	REMARKS 備 考
BT00110	HEXAGONAL HEAD BOLT	M8 X 25 SUS 304	000-862-149	4PCS XN-2/3A/4A
	SLOTTED HEX. BOLT	M6 X 25 SUS 304	000-862-133	6PCS XN-3
BT00111	HEX. WASHER HEAD BOLT (B)	M4 X 25 SUS 304	000-862-043	2PCS
BT00112	HEX. WASHER HEAD BOLT (B)	M4 X 16 SUS 304	000-882-042	4PCS
BT00113	HEX. WASHER HEAD BOLT (A)	M6 X 12 SUS 304	000-881-920	4PCS
BT00114	HEX. WASHER HEAD BOLT (A)	M6 X 12 SUS 304	000-881-920	4PCS
BT00115	HEX. WASHER HEAD BOLT (B)	M4 X 16 SUS 304	000-882-042	4PCS
BT00116	HEXAGONAL HEAD BOLT	03-001-3262-2	300-132-622	4PCS
BT00118	HEXAGONAL HEAD BOLT	M8 X 30 SUS 304	000-862-151	6PCS
BT00119	HEXAGONAL HEAD BOLT	M8 X 30 SUS 304	000-862-151	4PCS XN-2/3A/4A 6PCS XN-3
BT00120	HEX.WASHER HEAD BOLT (B)	M4 X 12 SUS 304	000-881-914	4PCS
BT00121	HEX.WASHER HEAD BOLT (B)	M4 X 12 SUS 304	000-881-914	4PCS
BT00122	HEXAGONAL HEAD BOLT	03-001-3262-2	300-132-622	4PCS
BT00123	HEX. BOLT(SLOTTED)	M8 X 25 SUS 304	000-882-074	2PCS FOR 5/10KW 4PCS 25KW
BT00125	HEX.WASHER HEAD BOLT (A)	M5 X 25 SUS304	000-881-922	2PCS
BT00150	HEX. WASHER HEAD BOLT (B)	M4 X 16 SUS 304	000-882-042	4PCS
BT00151	HEX. WASHER HEAD BOLT (B)	M4 X 16 SUS 304	000-882-042	4PCS
BT00152	HEXAGONAL HEAD BOLT	M4 X 30 (SUS)	000-862-116	2PCS
G 00101	DRIVE GEAR WITH TIMING DISK	03-001-3233-3/3232-4	300-132-333	
G 00102	SCANNER TURNING GEAR ASSY.	03-001-3241.42.43	300-132-412	
GK00101	O-RING	AS568-125, 1115-70	000-851-840	
GK00103	O-RING	AS568-125, 1115-70	000-851-840	
GK00104	O-RING	AS568-125, 1115-70	000-851-840	
GK00105	O-RING	AS568-142, 1115-70	000-851-855	
GK00106	PACKING	03-001-3263-1	300-132-631	
GK00107	PACKING	FOR JISF8801 25C	000-870-264	
GK00108	PACKING	03-001-3263-1	300-132-631	
GK00150	O-RING	AS568-125, 1115-70	000-851-840	2PCS

NOTE:

備 考:

Refer to the mechanical parts exploded view (DWG. NO. : C3307-033-A).

SYMBOL 記 号	PARTS NAME 部 品 名	TYPE／DWG. NO. 型名／図 番	CODE NO. コード番号	REMARKS 備 考
A 00300A	TRANSCEIVER MODULE	RTR-013	008-103-140	5KW D TYPE
	TRANSCEIVER MODULE	RTR-013A	008-103-150	5KW DA
	TRANSCEIVER MODULE	RTR-014	008-103-160	10KW D
	TRANSCEIVER MODULE	RTR-014A	008-103-170	10KW DA
A 00301	RF CHASSIS	03-014-5301	301-453-013	
A 00302	SHIELD CASE COVER	03-002-5303	300-253-030	
A 00303	AMP. CASE COVER	RRF-1302	340-613-022	
A 00304	IF AMP. CASE	03-001-5311	300-153-114	
A 00305	AMP. CASE FIXING PLATE	03-001-5312	300-153-124	
A 00306	STC PCB SUPPORTER	03-001-5313	300-153-131	
A 00307	MIC ADAPTER	03-006-5301	300-653-011	
A 00308	MIC FIXING PLATE	03-006-5302	300-653-021	
A 00309	W.G. GUIDE	03-001-5303	300-153-032	
A 00310	FILTER W.G.(2)	03-014-5311	100-004-380	
A 00311	W.G. WINDOW	03-007-5312	300-753-121	2PCS.
A 00312	SPACER (2)	HSA-3015	000-803-015	5PCS.
A 00313	SPACER (2)	HSA-3006	000-803-006	8PCS. (D) 10PCS. (DA)
A 00314	SPACER (2)	HSA-3030	000-803-030	4PCS.
A 00315	RUBBER BUSH	R-10 15X10X6X6H	000-871-409	
A 00316	CONNECTOR FIXING PLATE	03-001-5302	300-153-021	
A 00317	STICKER FOR IF AMPLIFIER	03-024-1058	100-074-420	D TYPE
	STICKER FOR IF AMPLIFIER	03-024-1059	100-074-430	DA TYPE
A 00318	MARK 8	03-004-0208	100-075-870	
A 00319	MAGNET INDICATING MARK	03-001-0207	300-102-070	
A 00320	STICKER FOR CONNECTOR	03-006-0202	300-602-021	
A 00321	STICKER (HIGH VOLTAGE)	R-12135-D	390-100-010	

NOTE:
備 考:

SYMBOL 記 号	PARTS NAME 部 品 名	TYPE/DWG. NO. 型名/図 番	CODE NO. コード番号	REMARKS 備 考
	Refer to the mechanical parts exploded view (DWG. NO. : C3307-036-A).			
A 00300A	RF UNIT ASSEMBLY	RTR-015	008-103-220	D TYPE
	RF UNIT ASSEMBLY	RTR-015A	008-103-230	DA TYPE
A 00301	SHIELD COVER	03-010-5303	301-053-030	
A 00302	RF CHASSIS	03-010-5301	301-053-014	
A 00303A	FILTER WAVE GUIDE ASSY	03-011-5344	008-330-230	
A 00304	W.G. GUIDE	03-001-5303	300-153-032	
A 00305	MIC FIXING PLATE	03-006-5302	300-653-021	
A 00306	CONNECTOR FIXING PLATE	03-010-5305	301-053-050	
A 00307	SCR COVER	03-010-5306	301-053-060	
A 00308	MIC ADOPTER	03-006-5301	300-653-011	
A 00309	IF AMP. CASE	03-001-5311	300-153-114	
A 00310	AMP. CASE COVER	RRF-1302	340-613-022	
A 00311	AMP. CASE FIXING PLATE	03-001-5312	300-153-124	
A 00312	STC PCB SUPPORTER	03-001-5313	300-153-131	
A 00313	FAN MOTOR FIXING PLATE	03-010-5304	301-053-040	
A 00314	RETAINER FOR FAN PLATE	03-010-5302	301-053-020	
A 00315	SPACER (2)	HSA-3025	000-803-025	5PCS.
A 00316	SPACER	HSA-3006	000-803-006	8PCS. (D) 10PCS. (DA)
A 00317	SPACER (2)	HSA-3030	000-803-030	4PCS.
A 00318	RUBBER BUSH	R-10 15X10X6X6H	000-871-409	
A 00319	MARK 8	03-004-0208	100-075-870	
A 00320	STICKER FOR IF AMPLIFIER	03-024-1058	100-074-420	D TYPE
	STICKER FOR IF AMPLIFIER	03-024-1059	100-074-430	DA TYPE
A 00321	CONNECTOR/RESISTOR STICKER	03-010-5361	301-053-610	
A 00322	MAGNET INDICATING MARK	03-001-0207	300-102-070	
A 00323	STICKER (HIGH VOLTAGE)	R-12135-D	390-100-010	
A 00324	STICKER FOR MAGNETRON	03-001-0208	300-102-080	
A 00325	RETAINER ANGLE	03-011-5310	301-153-102	2PCS.

NOTE:

備 考:

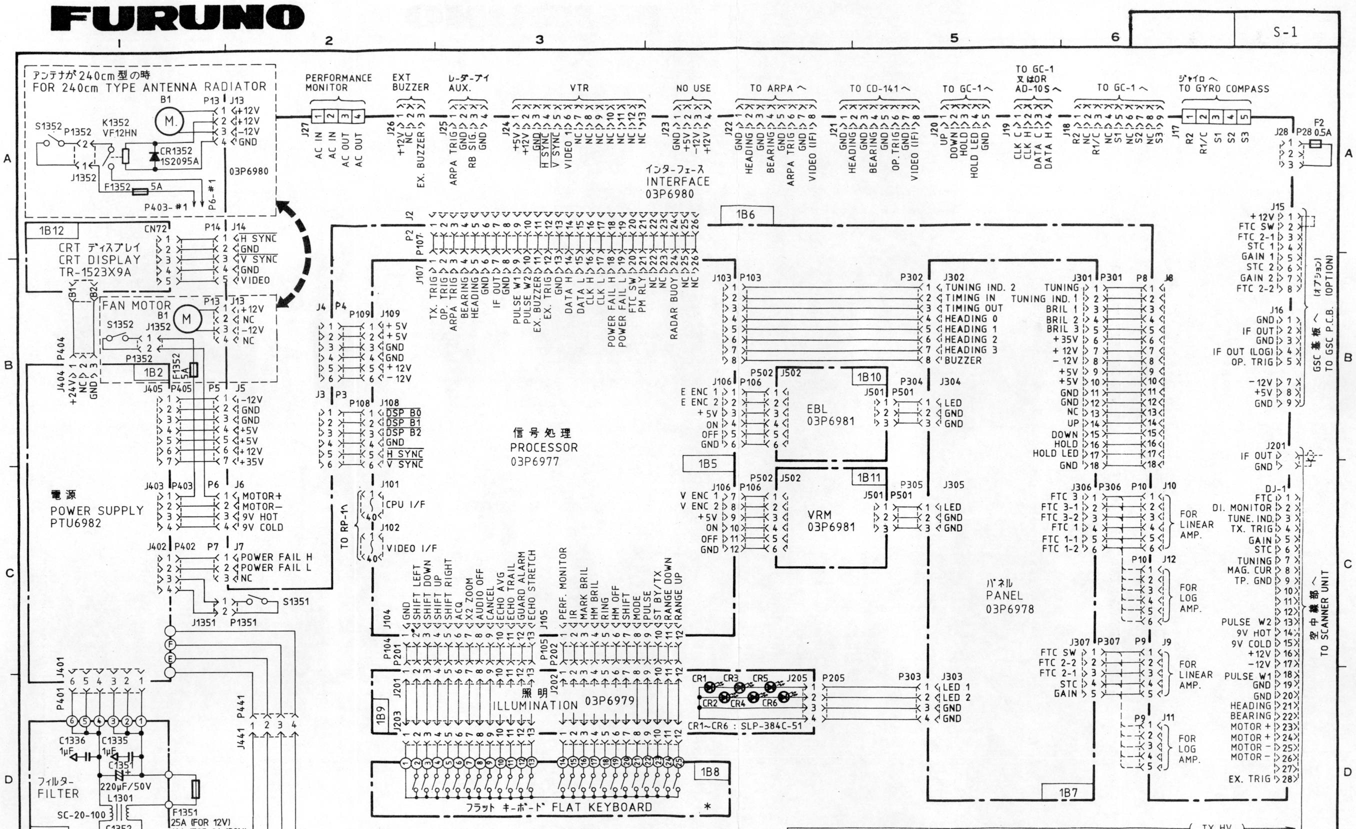
CONTENTS OF SCHEMATIC DIAGRAMS

No.	Item	Type	FR-□□□□□□						Page
			1505D	1505DA	1510D	1510DA	1525D	1525DA	
1	Display Unit		○	○	○	○	○	○	S-1
2	Power Supply Board	PTU-6982	○	○	○	○	○	○	S-2
3	Interface Board	03P6980	○	○	○	○	○	○	S-3
4	Panel Board	03P6978	○	○	○	○	○	○	S-4
5	EBL/VRM (Encoder) Board	03P6981	○	○	○	○	○	○	S-5
6	CRT Display	TR-1523X9A	○	○	○	○	○	○	S-6
7	TX HV Board	AHV-7130					○	○	S-7a
		BHV-7130	○	○	○	○			S-7b
8	Scanner Unit		○		○				S-8a
				○		○			S-8b
							○		S-8c
								○	S-8d
9	STC Board	ASTC-6995	○		○		○		S-9
		BSTC-6995		○		○		○	
10	IF Amplifier Board	BIF-4879	○		○		○		S-10a
		BIF-5668		○		○		○	S-10b
11	Interconnection Diagram		○	○	○	○	○	○	S-11

* The schematic diagram of Processor board (03P6977) is confidential and is not contained in this service manual.

FURUNO

S-1


1
2
3
4
5
6
A
B
C
D
アンテナが240cm型の時
FOR 240cm TYPE ANTENNA RADIATOR
B1
M
K1352
VF12HN
CR1352
1S2095A
F1352 5A
03P6980
PERFORMANCE MONITOR
EXT BUZZER
レーダーアイ AUX.
VTR
NO USE
TO ARPA へ
TO CD-141 へ
TO GC-1 へ
TO GC-1 又はOR AD-10S へ
TO GC-1 へ
ジャイロ へ TO GYRO COMPASS
インターフェース
INTERFACE
03P6980
1B6
1B12
CRT ディスプレイ
CRT DISPLAY
TR-1523X9A
FAN MOTOR
1B2
電源
POWER SUPPLY
PTU6982
信号処理
PROCESSOR
03P6977
TO RP-1へ
CPU I/F
VIDEO I/F
1B10
EBL
03P6981
1B5
1B11
VRM
03P6981
パネル
PANEL
03P6978
FOR LINEAR AMP.
FOR LOG AMP.
GSC 基板へ
TO GSC P.C.B.
(オプション) (OPTION)
空中線部へ
TO SCANNER UNIT
照明
ILLUMINATION 03P6979
1B9
CR1~CR6 : SLP-384C-51
1B8
フラット キーボード FLAT KEYBOARD
1B7
TX HV
フィルター
FILTER
SC-20-100
C1351 220μF/50V
F1351 25A (FOR 12V) 10A (FOR 24/32V)
1B3
03P6983
(−) (+) DTB-1
船内電源
SHIP'S MAINS
DC 12/24/32V
1B4
送信高圧 TX HV
AHV-7130 (1525D(A))
BHV-7130 (1505/1510 D(A))
J442
P442
F1 0.5A
DTB-2

NOTE: * 03P6953 (和; FOR JAPAN)
03P6984 (英; FOR OUTSIDE JAPAN)
03P6985 (オランダ; FOR NETHERLAND)

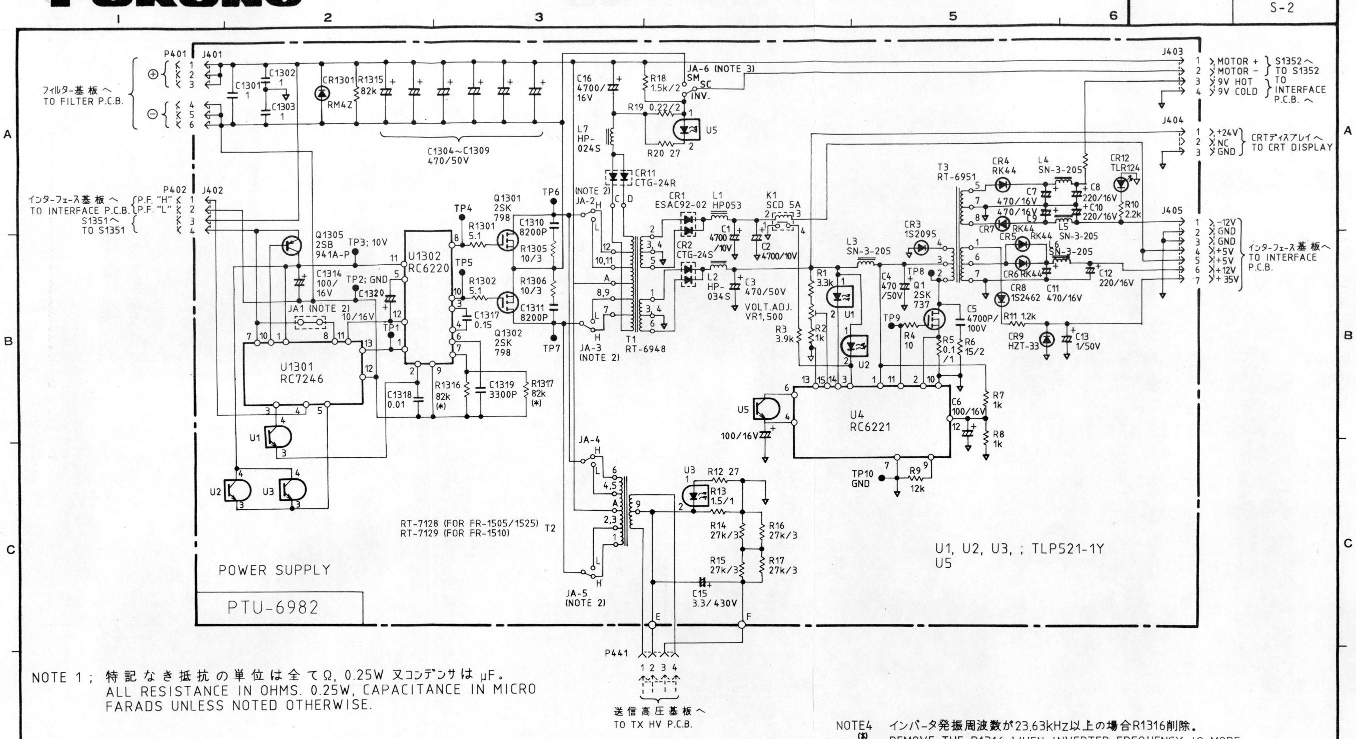
FR-1505D(A)/1510D(A)/1525D(A)

承認 APPROVED	MAY. 15. '87 T. NAKAJO	名称 TITLE	レーダー指示部 RADAR DISPLAY UNIT
検図 CHECKED	May. 15. '87 I. Amano		
製図 DRAWN	May. 14. '87 Y. Tomiyama	図番 DWG. NO.	C3307-007-D

FURUNO ELECTRIC CO., LTD.

FURUNO

S-2


P401
J401
フィルタ-基板へ
TO FILTER P.C.B.
C1301 1
C1302 1
C1303 1
CR1301 RM4Z
R1315 82k
C1304～C1309 470/50V
P402
J402
インターフェース基板へ
TO INTERFACE P.C.B.
P.F. "H"
P.F. "L"
S1351へ TO S1351
Q1305 2SB 941A-P
TP3; 10V
C1314 100/16V
TP2; GND
C1320 10/16V
JA1 (NOTE 2)
U1301 RC7246
U1302 RC6220
TP1
C1318 0.01
R1316 82k (*)
C1319 3300P
R1317 82k (*)
TP4
R1301 5.1
Q1301 2SK 798
C1310 8200P
R1305 10/3
TP5
R1302 5.1
R1306 10/3
C1311 8200P
C1317 0.15
Q1302 2SK 798
TP6
TP7
U1
U2
U3
JA-2 (NOTE 2)
JA-3 (NOTE 2)
JA-4
JA-5 (NOTE 2)
RT-7128 (FOR FR-1505/1525)
RT-7129 (FOR FR-1510)
T2
T1 RT-6948
C16 4700/16V
R18 1.5k/2
JA-6 (NOTE 3)
SM SC INV.
R19 0.22/2
R20 27
U5
L7 HP-024S
CR11 CTG-24R
CR1 ESAC92-02
CR2 CTG-24S
L1 HP053
L2 HP-034S
C1 4700/10V
K1 SCD 5A
C2 4700/10V
C3 470/50V
VOLT.ADJ. VR1,500
R3 3.9k
R1 3.3k
R2 1k
L3 SN-3-205
C4 470/50V
TP8
Q1 2SK 737
TP9
R4 10
R5 0.1/1
R6 15/2
C5 4700P/100V
CR3 1S2095
T3 RT-6951
CR4 RK44
CR5 RK44
CR6 RK44
CR7 RK44
CR8 1S2462
CR9 HZT-33
CR12 TLR124
L4 SN-3-205
L5 SN-3-205
L6
C7 470/16V
C8 220/16V
C9 470/16V
C10 220/16V
C11 470/16V
C12 220/16V
C13 1/50V
R10 2.2k
R11 1.2k
U4 RC6221
C6 100/16V
R7 1k
R8 1k
TP10 GND
R9 12k
U3
R12 27
R13 1.5/1
R14 27k/3
R15 27k/3
R16 27k/3
R17 27k/3
C15 3.3/430V
E
F
P441
送信高圧基板へ
TO TX HV P.C.B.
J403
MOTOR +
MOTOR −
9V HOT
9V COLD
S1352へ TO S1352
TO INTERFACE P.C.B.へ
J404
+24V
NC
GND
CRTディスプレイへ TO CRT DISPLAY
J405
−12V
GND
GND
+5V
+5V
+12V
+35V
インターフェース基板へ TO INTERFACE P.C.B.
U1, U2, U3, ; TLP521-1Y
U5
POWER SUPPLY
PTU-6982

NOTE 1 ; 特記なき抵抗の単位は全てΩ, 0.25W 又コンデンサは μF。
ALL RESISTANCE IN OHMS. 0.25W, CAPACITANCE IN MICRO FARADS UNLESS NOTED OTHERWISE.

NOTE 2 ; 電源仕様により右の様にジャンパーを変える。
CHANGE JUMPER CONNECTIONS ACCORDING TO SHIP'S MAINS VOLTAGE.

NOTE 3 ; 空中線型式により右の様にジャンパーする。
CHANGE CONNECTION WITH THE TYPE OF ANTENNA RADIATOR.

MAINS VTG.	JA-1	JA-2～JA-5
10.2～15V DC	SHORT	CONNECT TO "L"
20.4～40V DC	OPEN	CONNECT TO "H"

RADIATOR	JA-6	船内電源SHIP'S MAINS
XN-4A (2.4m)	SM INV SC	24V DC ONLY
その他 OTHERS	SM INV SC	12/24/32V DC

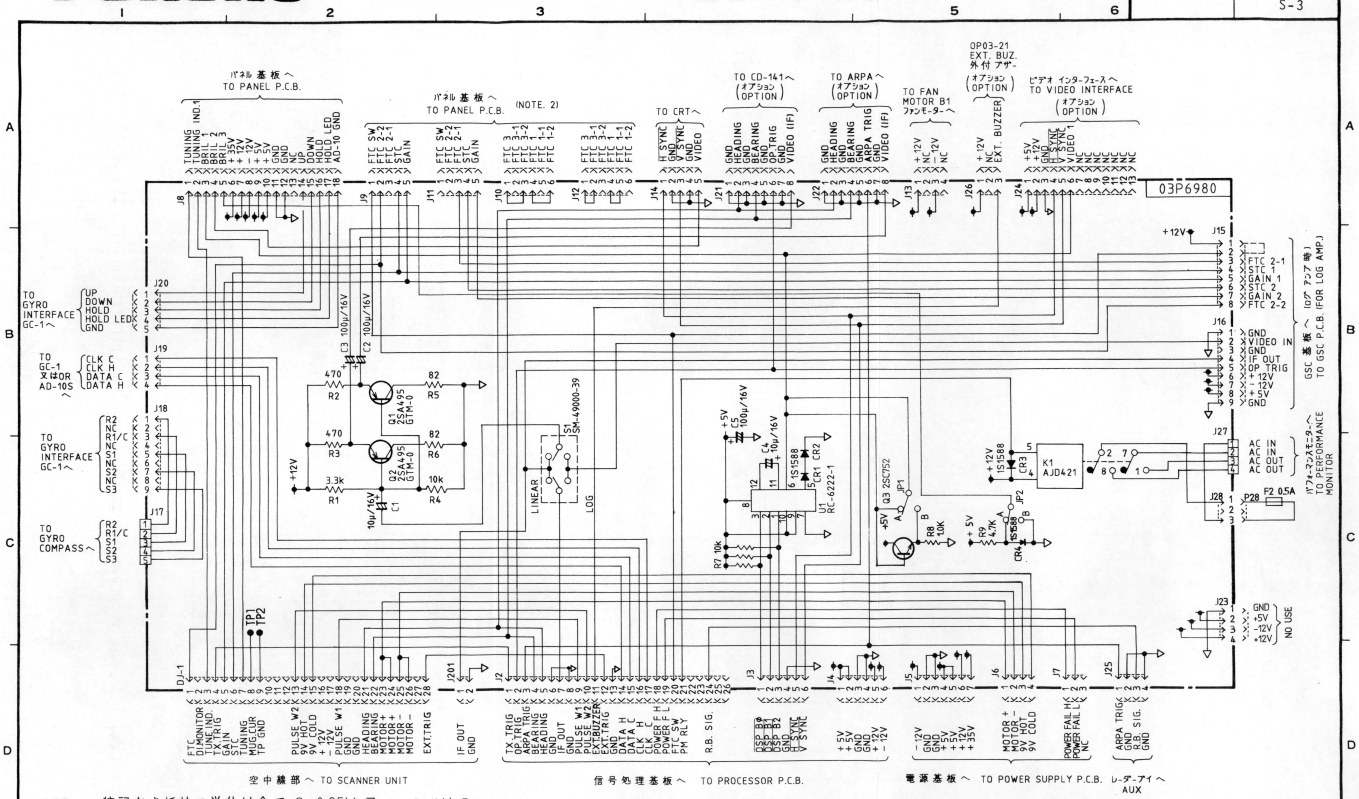
NOTE4 (*) インバータ発振周波数が23.63kHz以上の場合R1316削除。
REMOVE THE R1316 WHEN INVERTER FREQUENCY IS MORE THAN 23.63kHz.
インバータ発振周波数が21.38kHz以下の場合のみR1317を追加。
R1317 IS USED ONLY WHEN INVERTER FREQUNCY IS LESS THAN 21.38kHz.

FR-1500D(A) SERIES

承認 APPROVED	MAY・13・87 T. NAKANO	名称 TITLE PTU-6982	電源部回路図 POWER SUPPLY
検図 CHECKED	May・13・'87 I. Amano		
製図 DRAWN	May・12・'87 Y. Tomiyama	図番 DWG. NO.	C3307-006-C

FURUNO ELECTRIC CO., LTD.

FURUNO


1
2
3
5
6
A
B
C
D
パネル基板へ
TO PANEL P.C.B.
J8
TUNING
TUNING IND.1
BRIL 1
BRIL 2
BRIL 3
+35V
+12V
-12V
+5V
+5V
GND
GND
NC
UP
DOWN
HOLD
HOLD LED
AD-10 GND
パネル基板へ
TO PANEL P.C.B.
(NOTE. 2)
J9
J11
FTC SW
FTC 2-2
FTC 2-1
STC
GAIN
J10
J12
FTC 3
FTC 3-1
FTC 3-2
FTC 1
FTC 1-1
FTC 1-2
TO CRTへ
J14
H SYNC
GND
V SYNC
GND
VIDEO
TO CD-141へ
(オプション OPTION)
J21
GND
HEADING
GND
BEARING
GND
OP.TRIG
GND
VIDEO (IF)
TO ARPAへ
(オプション OPTION)
J22
GND
HEADING
GND
BEARING
GND
ARPA TRIG
GND
VIDEO (IF)
TO FAN MOTOR B1
ファンモーターへ
J13
+12V
NC
-12V
NC
OP03-21
EXT. BUZ.
外付ブザー
(オプション OPTION)
J26
+12V
NC
EXT. BUZZER
ビデオインターフェースへ
TO VIDEO INTERFACE
(オプション OPTION)
J24
+5V
+12V
GND
H SYNC
V SYNC
VIDEO 1
NC
03P6980
+12V
J15
FTC 2-1
STC 1
GAIN 1
STC 2
GAIN 2
FTC 2-2
J16
GND
VIDEO IN
GND
IF OUT
OP TRIG
+12V
-12V
+5V
GND
GSC 基板へ (ログアンプ時)
TO GSC P.C.B. (FOR LOG AMP.)
J27
AC IN
AC IN
AC OUT
AC OUT
パフォーマンスモニターへ
TO PERFORMANCE MONITOR
J28
P28
F2 0.5A
J23
GND
+5V
-12V
+12V
NO USE
TO GYRO INTERFACE GC-1へ
J20
UP
DOWN
HOLD
HOLD LED
GND
TO GC-1 又はOR AD-10Sへ
J19
CLK C
CLK H
DATA C
DATA H
TO GYRO INTERFACE GC-1へ
J18
R2
NC
R1/C
NC
S1
NC
S2
NC
S3
TO GYRO COMPASSへ
J17
R2
R1/C
S1
S2
S3
C3 100μ/16V
C2 100μ/16V
470
R2
470
R3
3.3k
R1
+12V
Q1 2SA495 GTM-0
Q2 2SA495 GTM-0
82
R5
82
R6
10k
R4
10μ/16V C1
S1 SM-49000-39
LINEAR
LOG
TP1
TP2
+5V C5 100μ/16V
C4 10μ/16V
1S1588
CR1
CR2
U1 RC-6222-1
R7 10K
Q3 2SC752
JP1
A
B
+5V
R8 1.0K
+12V
1S1588
CR3
K1 AJD421
JP2
+5V
R9 4.7K
1S1588
CR4
DJ-1
FTC
DI.MONITOR
TUNE IND.
TX.TRIG
GAIN
STC
TUNING
MUG.CUR
TP GND
PULSE W2
9V HOT
9V COLD
+12V
-12V
PULSE W1
GND
GND
HEADING
BEARING
MOTOR+
MOTOR+
MOTOR-
MOTOR-
EXT.TRIG
J201
IF OUT
GND
空中線部へ TO SCANNER UNIT
J2
TX TRIG
OP TRIG
ARPA TRIG
BEARING
HEADING
GND
IF OUT
GND
PULSE W1
PULSE W2
EXT.BUZZER
EXT.TRIG
GND
DATA H
DATA C
CLK H
CLK C
POWER F H
POWER F L
FTC SW
PM RLY
R.B. SIG.
信号処理基板へ TO PROCESSOR P.C.B.
J3
DSP B0
DSP B1
DSP B2
GND
H SYNC
V SYNC
J4
+5V
+5V
GND
GND
+12V
-12V
J5
-12V
GND
GND
+5V
+5V
+12V
+35V
J6
MOTOR+
MOTOR-
9V HOT
9V COLD
電源基板へ TO POWER SUPPLY P.C.B.
J7
POWER FAIL H
POWER FAIL L
NC
J25
ARPA TRIG
GND
R.B. SIG.
GND
レーダーブイへ
AUX

NOTE 1: 特記なき抵抗の単位は全て Ω, 0.25W 又 コンデンサは F。
ALL RESISTANCE IN OHMS. 0.25W, CAPACITANCE IN FARADS UNLESS NOTED OTHERWISE.

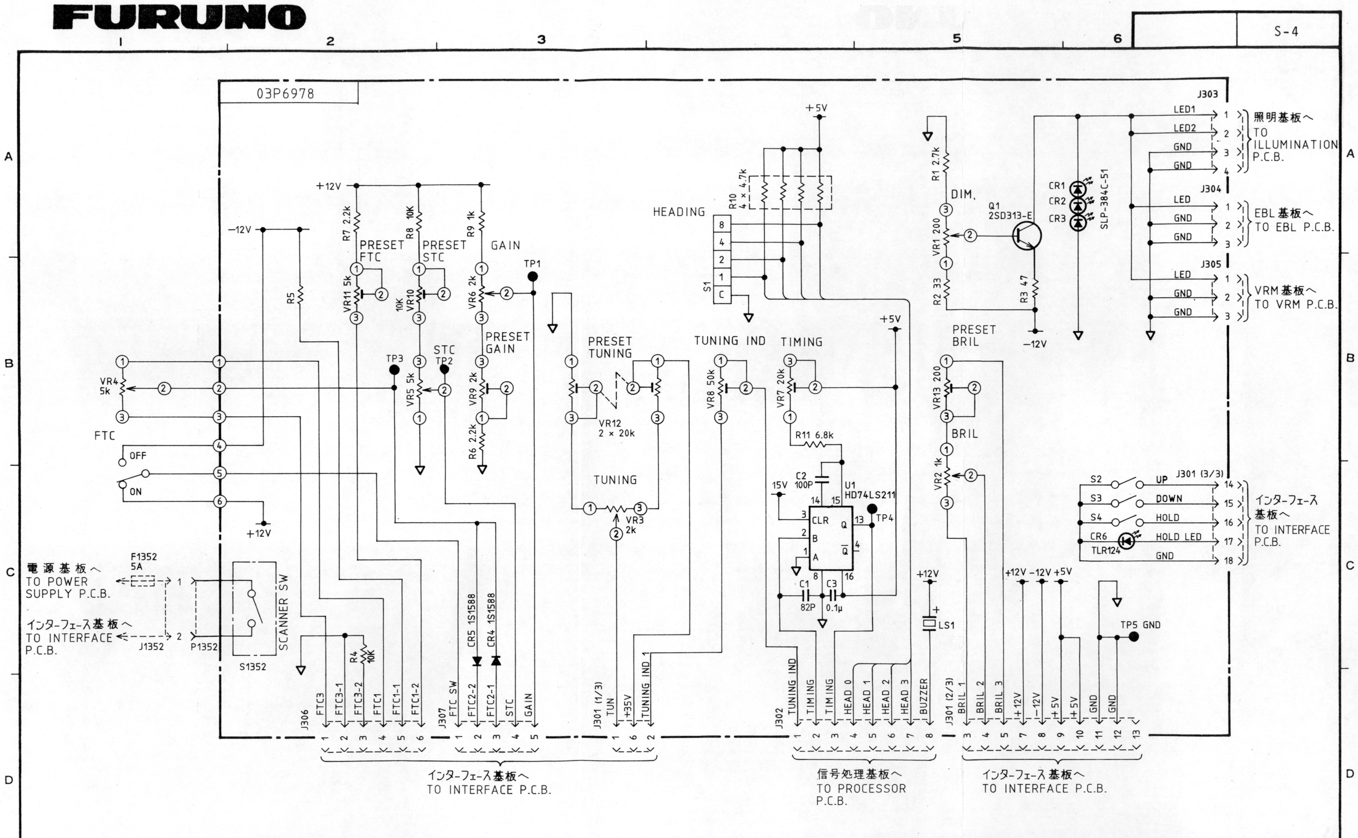
NOTE 2: IF アンプのタイプにより、結線を右の表の様に変える。
CHANGE CONNECTIONS ACCORDING TO TYPE OF IF AMP.. REFER TO TABLE AT RIGHT.

TYPE OF IF AMP.	CONNECTION	
LINEAR TYPE	J306 ←→ J10 (PANEL P.C.B.) (INTERFACE P.C.B.)	J307 ←→ J9 (PANEL P.C.B.) (INTERFACE P.C.B.)
LOG TYPE	J306 ←→ J12 (PANEL P.C.B.) (INTERFACE P.C.B.)	J307 ←→ J11 (PANEL P.C.B.) (INTERFACE P.C.B.)

FR-1500D(A)SERIES

承認 APPROVED	APR • 30 • '87 T. NAKANO	名称 TITLE 03P6980	インターフェース基板 INTERFACE P.C.B.
検図 CHECKED	APRIL • 30 • '87 I. Amano		
製図 DRAWN	April • 30 • '87 Y. [illegible]	図番 DWG. NO.	C3307-010-D

FURUNO ELECTRIC CO., LTD.


03P6978
+12V
−12V
R7 2.2k
R8 10K
R9 1k
PRESET FTC
PRESET STC
GAIN
TP1
VR11 5k
VR10 10K
VR6 2k
R5
TP3
STC TP2
PRESET GAIN
VR4 5k
VR5 5k
VR9 2k
R6 2.2k
FTC
OFF
ON
+12V
HEADING
R10 4 × 4.7k
S1
8
4
2
1
C
+5V
PRESET TUNING
VR12 2 × 20k
TUNING
VR3 2k
TUNING IND
VR8 50k
TIMING
VR7 20k
R11 6.8k
C2 100P
15V
U1 HD74LS211
CLR
B
A
Q
TP4
C1 82P
C3 0.1μ
+12V
LS1
R1 2.7k
DIM.
Q1 2SD313-E
VR1 200
R2 33
R3 47
−12V
CR1
CR2
CR3
SLP-384C-51
PRESET BRIL
VR13 200
BRIL
VR2 1k
J303
LED1
LED2
GND
GND
照明基板へ
TO ILLUMINATION P.C.B.
J304
LED
GND
GND
EBL基板へ
TO EBL P.C.B.
J305
LED
GND
GND
VRM基板へ
TO VRM P.C.B.
S2
S3
S4
CR6 TLR124
UP
DOWN
HOLD
HOLD LED
GND
J301 (3/3)
インターフェース基板へ
TO INTERFACE P.C.B.
+12V −12V +5V
TP5 GND
電源基板へ
TO POWER SUPPLY P.C.B.
F1352 5A
インターフェース基板へ
TO INTERFACE P.C.B.
J1352
P1352
S1352
SCANNER SW
R4 10K
CR5 1S1588
CR4 1S1588
J306
FTC3
FTC3-1
FTC3-2
FTC1
FTC1-1
FTC1-2
J307
FTC SW
FTC2-2
FTC2-1
STC
GAIN
J301 (1/3)
TUN
+35V
TUNING IND 1
J302
TUNING IND
TIMING
TIMING
HEAD 0
HEAD 1
HEAD 2
HEAD 3
BUZZER
J301 (2/3)
BRIL 1
BRIL 2
BRIL 3
+12V
−12V
+5V
+5V
GND
GND
インターフェース基板へ
TO INTERFACE P.C.B.
信号処理基板へ
TO PROCESSOR P.C.B.
インターフェース基板へ
TO INTERFACE P.C.B.

NOTE 1. 特記なき抵抗の単位は全てΩ, 0.25W 又コンデンサはF.
ALL RESISTANCE IN OHMS, 0.25W, CAPACITANCE IN FARADS UNLESS NOTED OTHERWISE.

FR-1500D (A) SERIES

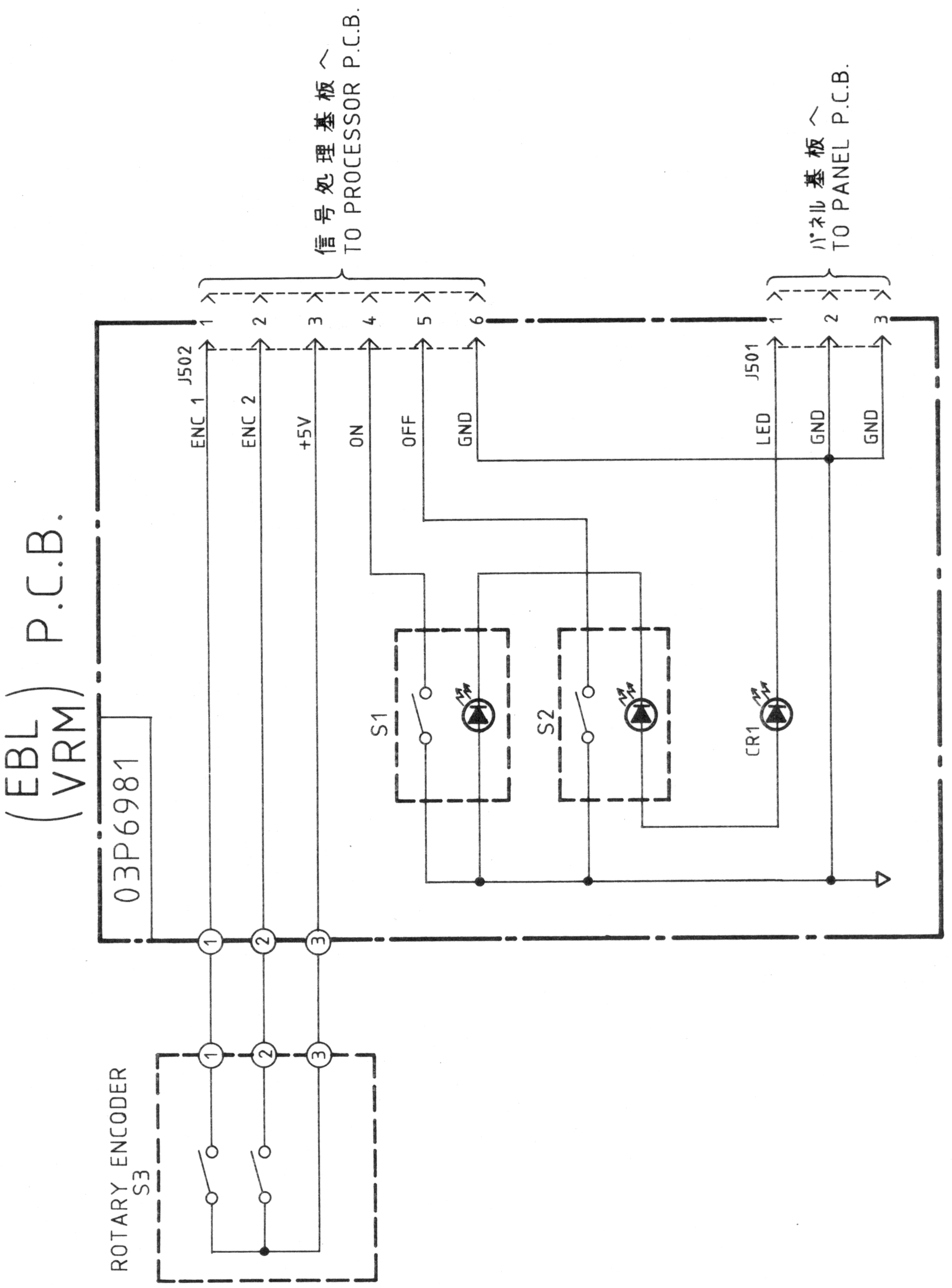
承認 APPROVED	MAY・21・87 T. NAKANO	名称 TITLE	03P6978 パネル基板 PANEL P.C.B.
検図 CHECKED	May・21・'87 I. Amano		
製図 DRAWN	・ ・	図番 DWG. NO.	C3307-012-B

FURUNO ELECTRIC CO., LTD.

A

C

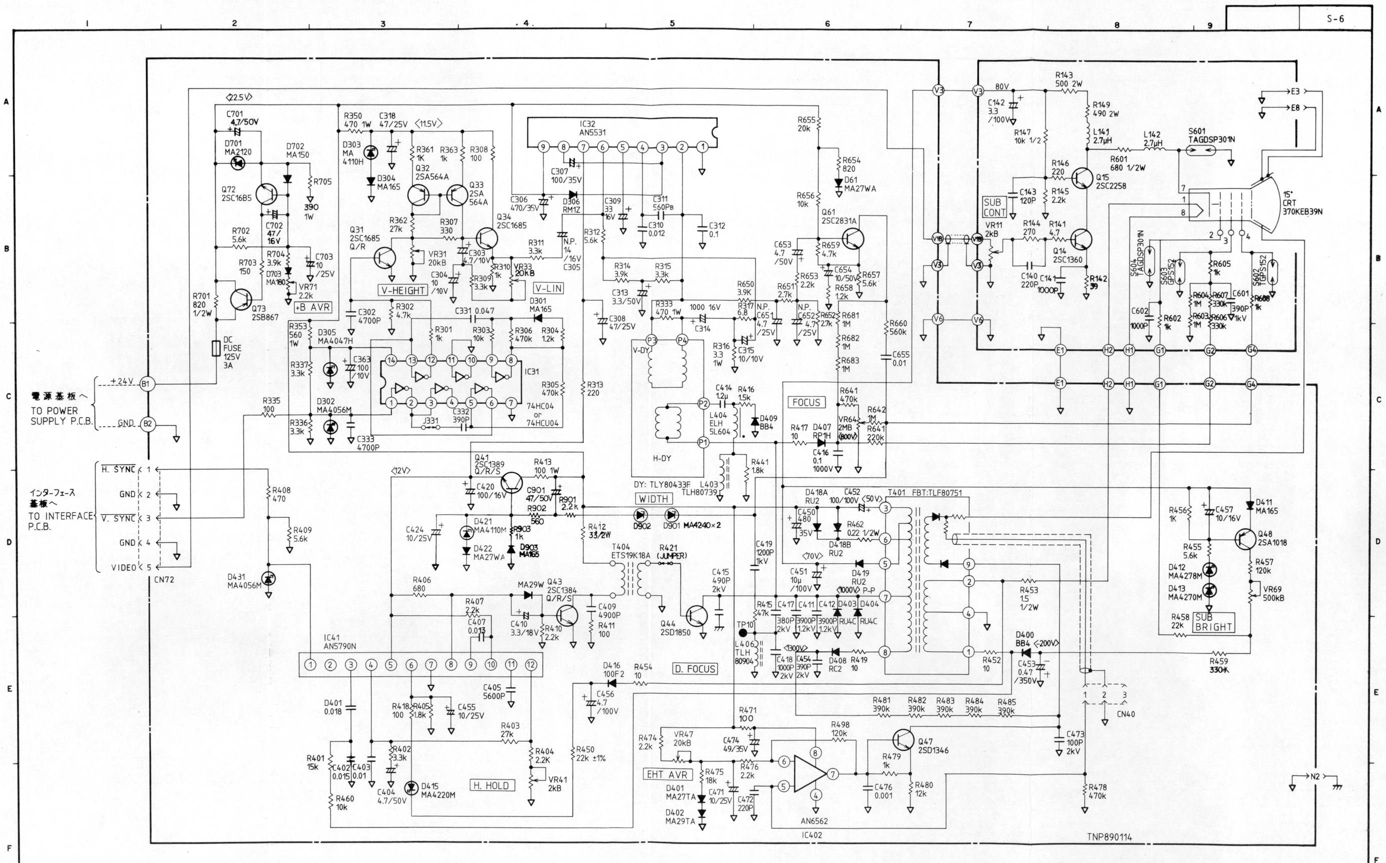
D


信号処理基板へ
TO PROCESSOR P.C.B.
パネル基板へ
TO PANEL P.C.B.
1
2
3
4
5
6
1
2
3
J502
J501
ENC 1
ENC 2
+5V
ON
OFF
GND
LED
GND
GND
(EBL VRM) P.C.B.
03P6981
S1
S2
CR1
①
②
③
①
②
③
ROTARY ENCODER S3

FR-1500D(A) SERIES

承認 APPROVED	MAY. 7 .'87 T. NAKANO	名称 TITLE	03P6981	EBL, VRM 基板 EBL, VRM P.C.B.
検図 CHECKED	MAY. 7 .'87 I. Amano			
製図 DRAWN	May. 6 .'87 Y. Tomiyama	図番 DWG. NO.		C3307-008-A

FURUNO ELECTRIC CO., LTD.


電源基板へ
TO POWER SUPPLY P.C.B.
+24V
GND
インターフェース基板へ
TO INTERFACE P.C.B.
H. SYNC
V. SYNC
VIDEO
CN72
DC FUSE 125V 3A
+B AVR
V-HEIGHT
V-LIN
IC31 74HC04 or 74HCU04
IC32 AN5531
IC41 AN5790N
IC402 AN6562
WIDTH
D. FOCUS
H. HOLD
EHT AVR
FOCUS
H-DY
V-DY
DY: TLY80433F
T401 FBT:TLF80751
T404 ETS19K18A
SUB CONT
SUB BRIGHT
15" CRT 370KEB39N
S601 TAGDSP301N
CN40
TNP890114

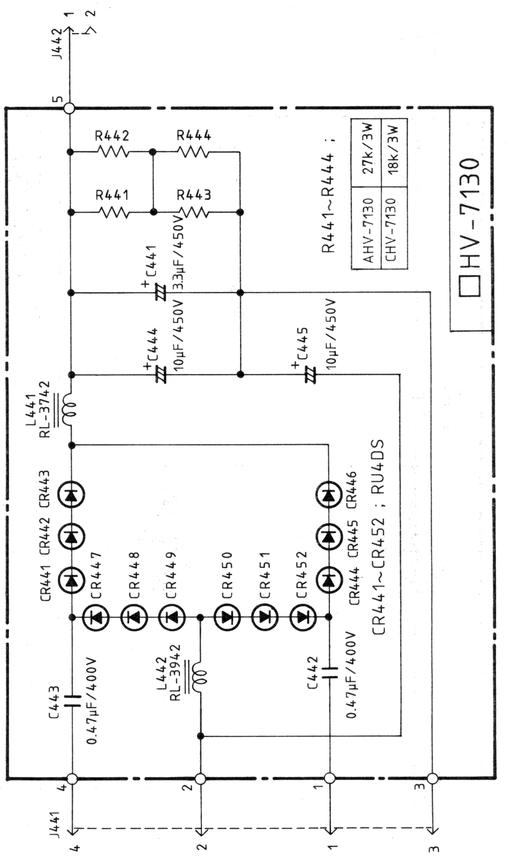
NOTE : 1. 特記なき抵抗は全てΩ, コンデンサはμF。
ALL RESISTANCE IN ORMS AND CAPACITANCE IN MICRO FARAD UNLESS NOTED OTHERWISE.

承 認 APPROVED	June. 10 '87 T. NAKANO	名 称 TITLE	TR-1523X9A CRT ディスプレイ CRT DISPLAY
検 図 CHECKED	June. 9 '87 I. Amano		
製 図 DRAWN	June. 9 '87 Y. Tomiyama	図 番 DWG.NO.	C3307-021-C

FR-1500D(A) SERIES

FURUNO

S-7a

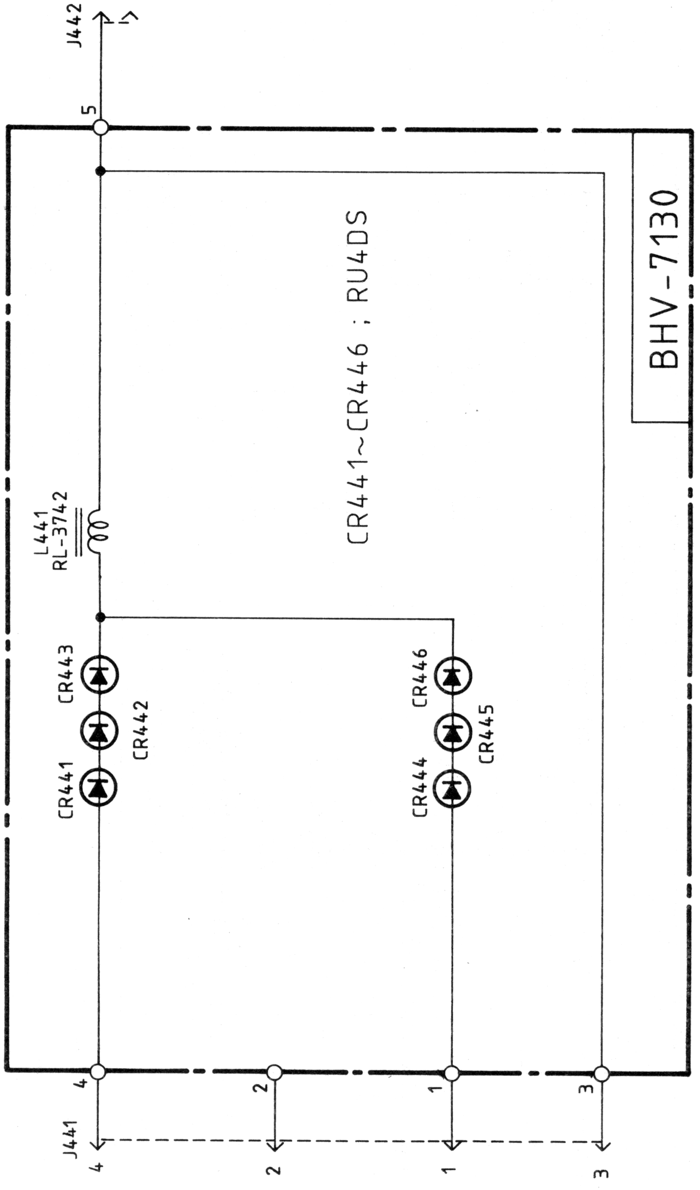

J442
1
2
5
R442
R444
R441
R443
R441~R444 ;
AHV-7130 27k/3W
CHV-7130 18k/3W
□HV-7130
C441
3.3μF/450V
C444
10μF/450V
C445
10μF/450V
L441
RL-3742
CR441
CR442
CR443
CR447
CR448
CR449
CR450
CR451
CR452
CR444
CR445
CR446
CR441~CR452 ; RU4DS
C443
0.47μF/400V
L442
RL-3942
C442
0.47μF/400V
J441
4
2
1
3

FR-8250D(A)
FR-2020
FR-1525D(A)

承　認 APPROVED	APR. 24 .'87 T. [illegible]	名　称 TITLE	AHV-7130　送信 高圧 CHV-7130　TX　HV
検　図 CHECKED	APR. 23 . '87 I. Amano		
製　図 DRAWN	April . 23 .'87 Y. Tomiyama	図　番 DWG.NO.	C3307-004-D

FURUNO ELECTRIC CO., LTD.

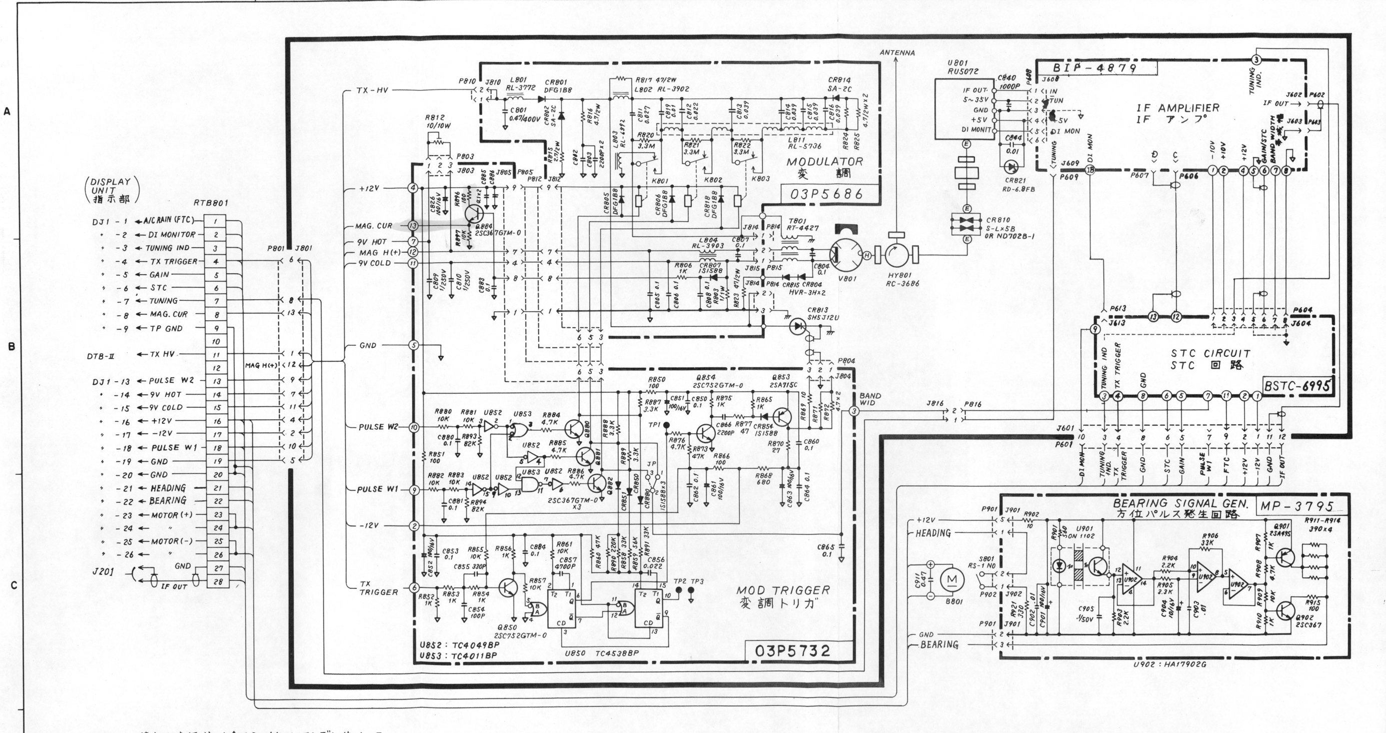
FURUNO


J442
5
BHV-7130
CR441~CR446 ; RU4DS
L441
RL-3742
CR443
CR442
CR441
CR446
CR445
CR444
4
2
1
3
J441
4
2
1
3

FR-8050D(A)/8100D(A)
FR-2010
FR-1505D(A)/1510D(A)

承 認 APPROVED	APR. 24 . '87 T. NAKANO	名 称 TITLE	BHV-7130 送信 高圧 TX HV
検 図 CHECKED	APR. 23 . '87 I. Amano		
製 図 DRAWN	April. 23 . '87 Y. Tomiyama	図 番 DWG. NO.	C3307-005-F

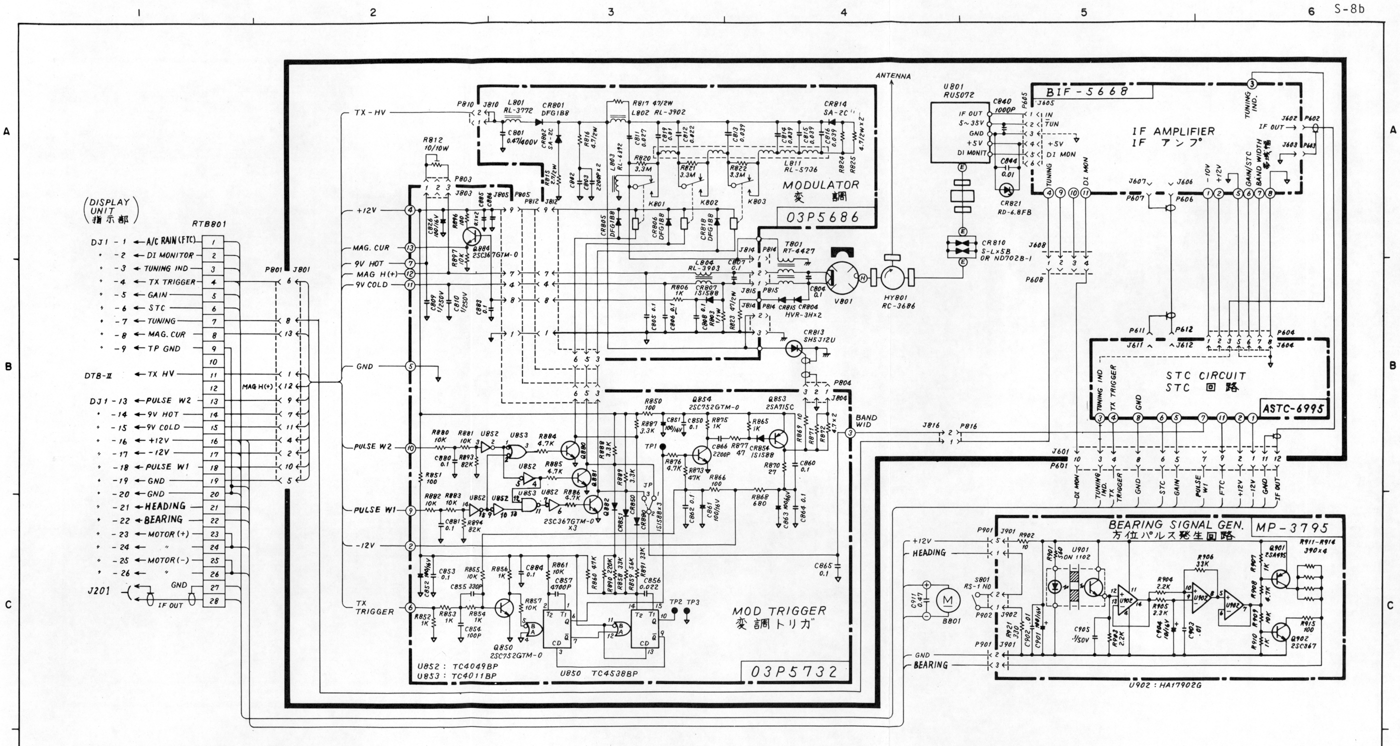
FURUNO ELECTRIC CO., LTD.


(DISPLAY UNIT 指示部)
RTB801
DJ1 - 1 A/C RAIN (FTC)
- 2 DI MONITOR
- 3 TUNING IND
- 4 TX TRIGGER
- 5 GAIN
- 6 STC
- 7 TUNING
- 8 MAG. CUR
- 9 TP GND
DTB-II TX HV
DJ1 - 13 PULSE W2
- 14 9V HOT
- 15 9V COLD
- 16 +12V
- 17 -12V
- 18 PULSE W1
- 19 GND
- 20 GND
- 21 HEADING
- 22 BEARING
- 23 MOTOR (+)
- 24 "
- 25 MOTOR (-)
- 26 "
J201
GND
IF OUT
P801 J801
MAG H(+)
TX - HV
+12V
MAG. CUR
9V HOT
MAG H(+)
9V COLD
GND
PULSE W2
PULSE W1
-12V
TX TRIGGER
MODULATOR 変調
03P5686
MOD TRIGGER 変調トリガ
03P5732
U852 : TC4049BP
U853 : TC4011BP
U850 TC4538BP
ANTENNA
V801
HY801 RC-3686
U801 RU5072
CR810 S-L×SB OR ND702B-1
CR821 RD-6.8FB
BIP-4879
IF AMPLIFIER IF アンプ
TUNING IND.
IF OUT
DI MON
STC CIRCUIT STC 回路
BSTC-6995
BAND WID
BEARING SIGNAL GEN. 方位パルス発生回路
MP-3795
+12V
HEADING
GND
BEARING
B801
U902 : HA17902G

NOTE 1. 特記なき抵抗は全てΩ, 1/4W, コンデンサはμF。
ALL RESISTANCE IN OHMS, 1/4W, CAPACITANCE IN MICRO FARADS
UNLESS NOTED OTHERWISE.

FR-8050D/8100D
FR-1505D/1510D

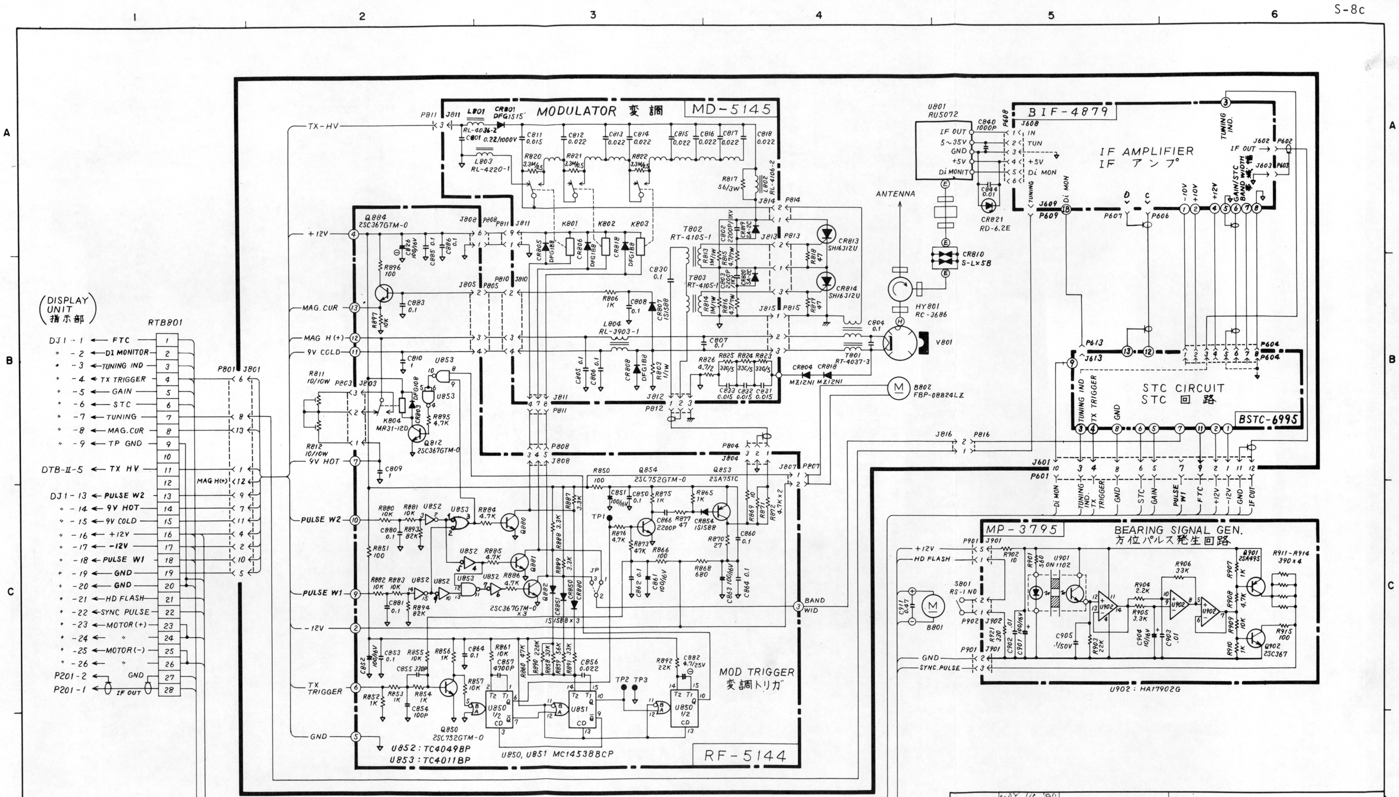
承認 APPROVED	MAY. 14. '87 T. NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	SCANNER UNIT 空中線部
検図 CHECKED	May 14. '87 I. Amano	尺度 SCALE	/		
製図 DRAWN	May. 14. '87 Y. Tomiyama	重量 WEIGHT	kg	図番 DWG. NO.	C3307-013-E


1
2
3
4
5
6
A
B
C
D
(DISPLAY UNIT)
指示部
RTB801
DJ1 - 1 A/C RAIN (FTC)
- 2 DI MONITOR
- 3 TUNING IND
- 4 TX TRIGGER
- 5 GAIN
- 6 STC
- 7 TUNING
- 8 MAG. CUR
- 9 TP GND
DTB-II TX HV
DJ1 - 13 PULSE W2
- 14 9V HOT
- 15 9V COLD
- 16 +12V
- 17 -12V
- 18 PULSE W1
- 19 GND
- 20 GND
- 21 HEADING
- 22 BEARING
- 23 MOTOR (+)
- 25 MOTOR (-)
J201
GND
IF OUT
P801
J801
MAG H(+)
TX-HV
+12V
MAG. CUR
9V HOT
MAG H(+)
9V COLD
GND
PULSE W2
PULSE W1
-12V
TX TRIGGER
MODULATOR
変調
03P5686
ANTENNA
V801
HY801
RC-3686
T801
RT-4427
CR813
SHS 312U
U801
RU5072
IF OUT
5~35V
GND
+5V
DI MONIT
CR821
RD-6.8FB
CR810
S-L5B
OR ND7028-1
BIF-5668
IF AMPLIFIER
IF アンプ
TUNING
DI MON
TUNING IND.
GAIN/STC
BAND WIDTH
IF OUT
STC CIRCUIT
STC 回路
ASTC-6995
BAND WID
MOD TRIGGER
変調トリガ
03P5732
U852 : TC4049BP
U853 : TC4011BP
U850 TC4S38BP
Q850
2SC752GTM-0
Q854
2SC752GTM-0
Q853
2SA715C
BEARING SIGNAL GEN.
方位パルス発生回路
MP-3795
+12V
HEADING
GND
BEARING
B801
S801
RS-1 NO
U901
ON 1102
Q901
2SA495
Q902
2SC367
U902 : HA17902G
DI MON
TUNING IND.
TX TRIGGER
GND
STC
GAIN
PULSE W1
FTC
+12V
GND
IF OUT

NOTE 1. 特記なき抵抗は全てΩ, 1/4W, コンデンサはμF。
ALL RESISTANCE IN OHMS, 1/4W, CAPACITANCE IN MICRO FARADS
UNLESS NOTED OTHERWISE.

FR-8050DA/8100DA
FR-1505DA/1510DA

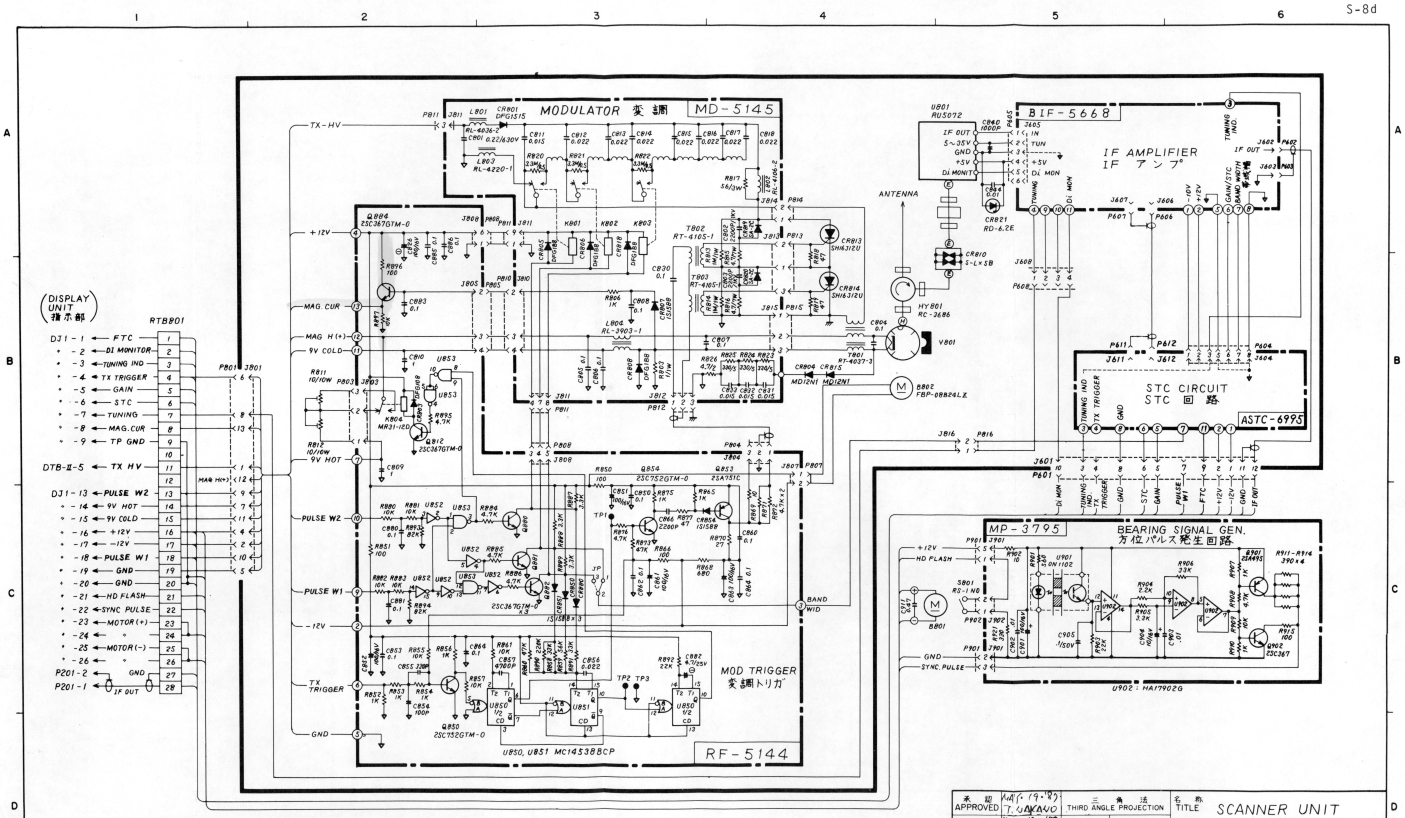
承認 APPROVED	MAY. 14. '87 T. NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	SCANNER UNIT 空中線部
検図 CHECKED	May. 14. '87 I. Amano	尺度 SCALE	/		
製図 DRAWN	May. 14. '87 Y. Tomiyama	重量 WEIGHT	kg	図番 DWG. NO.	C3307-016-E


1
2
3
4
5
6
A
B
C
D
DISPLAY UNIT 指示部
RTB801
DJ1-1 FTC
-2 DI MONITOR
-3 TUNING IND
-4 TX TRIGGER
-5 GAIN
-6 STC
-7 TUNING
-8 MAG.CUR
-9 TP GND
DTB-II-5 TX HV
DJ1-13 PULSE W2
-14 9V HOT
-15 9V COLD
-16 +12V
-17 -12V
-18 PULSE W1
-19 GND
-20 GND
-21 HD FLASH
-22 SYNC PULSE
-23 MOTOR(+)
-25 MOTOR(-)
P201-2 GND
P201-1 IF OUT
P801 J801
MAG H(+)
MODULATOR 変調
MD-5145
RF-5144
MOD TRIGGER 変調トリガ
U852 : TC4049BP
U853 : TC4011BP
U850, U851 MC14538BCP
ANTENNA
HY801 RC-3686
V801
B802 FBP-08824LZ
CR810 S-LX5B
U801 RU5072
CR821 RD-6.2E
BIF-4879
IF AMPLIFIER IF アンプ
STC CIRCUIT STC 回路
BSTC-6995
MP-3795
BEARING SIGNAL GEN. 方位パルス発生回路
U902 : HA17902G
B801
S801 RS-1 NO
BAND WID
TX-HV
MAG.CUR
MAG H(+)
9V COLD
9V HOT
PULSE W2
PULSE W1
TX TRIGGER
GND
HD FLASH
SYNC PULSE
TUNING IND
DI MON
IF OUT

NOTE 1. 特記なき抵抗はΩ, 1/4W, コンデンサはμF。
ALL RESISTANCE IN OHMS, 1/4W AND CAPACITANCE IN MICRO FARAD UNLESS NOTED OTHERWISE.

FR-8250D
FR-1525D

承認 APPROVED	MAY. 14. '87 T. NAKANO	三角法 THIRD ANGLE PROJECTION	名称 TITLE	SCANNER UNIT 空中線部
検図 CHECKED	May. 14. '87 L. Amano	尺度 SCALE	/	
製図 DRAWN	May. 14. '87 Y. Tomiyama	重量 WEIGHT	kg	図番 DWG. NO. C3307-015-D

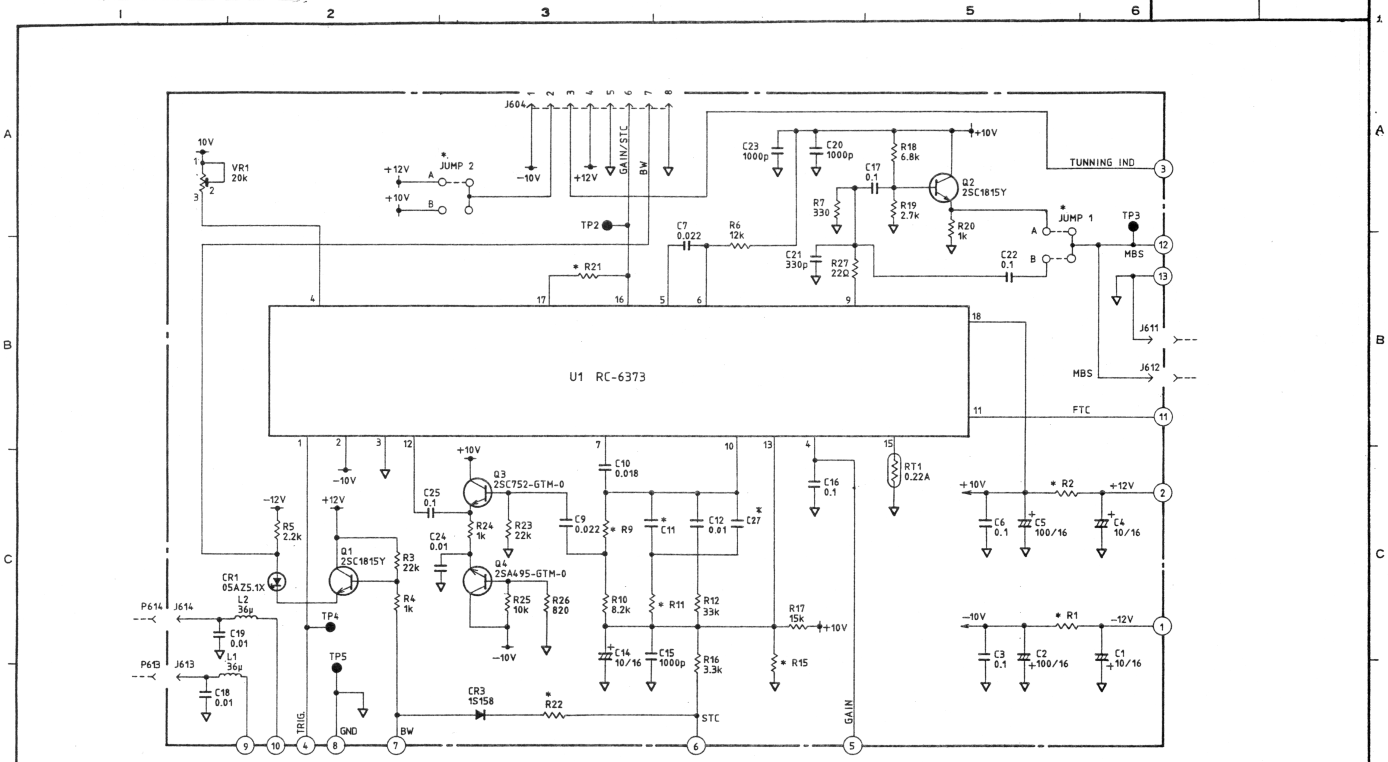

1
2
3
4
5
6
A
B
C
D
MODULATOR 変調
MD-5145
BIF-5668
IF AMPLIFIER
IF アンプ
STC CIRCUIT
STC 回路
ASTC-6995
MP-3795
BEARING SIGNAL GEN.
方位パルス発生回路
MOD TRIGGER
変調トリガ
RF-5144
ANTENNA
HY801
RC-3686
V801
B802
FBP-08824LZ
T801
RT-4037-3
U801
RU5072
(DISPLAY UNIT 指示部)
RTB801
DJ1-1 FTC
DJ1-2 DI MONITOR
DJ1-3 TUNING IND
DJ1-4 TX TRIGGER
DJ1-5 GAIN
DJ1-6 STC
DJ1-7 TUNING
DJ1-8 MAG.CUR
DJ1-9 TP GND
DTB-II-5 TX HV
DJ1-13 PULSE W2
DJ1-14 9V HOT
DJ1-15 9V COLD
DJ1-16 +12V
DJ1-17 -12V
DJ1-18 PULSE W1
DJ1-19 GND
DJ1-20 GND
DJ1-21 HD FLASH
DJ1-22 SYNC PULSE
DJ1-23 MOTOR(+)
DJ1-24
DJ1-25 MOTOR(-)
DJ1-26
P201-2 GND
P201-1 IF OUT
TX-HV
+12V
MAG.CUR
MAG H(+)
9V COLD
9V HOT
PULSE W2
PULSE W1
-12V
TX TRIGGER
GND
BAND WID
U850, U851 MC14538BCP
U902 : HA17902G

NOTE 1. 特記なき抵抗はΩ, 1/4W, コンデンサはμF.
ALL RESISTANCE IN OHMS, 1/4W AND CAPACITANCE IN MICRO FARAD UNLESS NOTED OTHERWISE.

FR-8250DA
FR-1525DA

承認 APPROVED	MAY. 19. '87 T. NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	SCANNER UNIT 空中線部
検図 CHECKED	May. 19. '87 I. Amano	尺度 SCALE	/		
製図 DRAWN	May. 18. '87 Y. Tomiyama	重量 WEIGHT	kg	図番 DWG.NO.	C3307-017-C

FURUNO



1
2
3
5
6
A
B
C
D
J604
1
2
3
4
5
6
7
8
10V
VR1
20k
+12V
JUMP 2
A
B
+10V
-10V
+12V
GAIN/STC
BW
TP2
C23
1000p
C20
1000p
R18
6.8k
C17
0.1
R7
330
R19
2.7k
Q2
2SC1815Y
+10V
R20
1k
TUNNING IND
JUMP 1
TP3
MBS
C7
0.022
R6
12k
C21
330p
R27
22Ω
C22
0.1
R21
17
16
4
5
6
9
18
U1 RC-6373
J611
J612
MBS
11
FTC
1
2
3
12
7
10
13
4
15
-10V
+10V
Q3
2SC752-GTM-0
C25
0.1
R24
1k
R23
22k
C9
0.022
R9
C10
0.018
C11
C12
0.01
C27
C16
0.1
RT1
0.22A
+10V
R2
+12V
C6
0.1
C5
100/16
C4
10/16
-12V
R5
2.2k
CR1
05AZ5.1X
Q1
2SC1815Y
R3
22k
R4
1k
C24
0.01
Q4
2SA495-GTM-0
R25
10k
R26
820
R10
8.2k
R11
R12
33k
R17
15k
+10V
-10V
R1
-12V
C3
0.1
C2
100/16
C1
10/16
P614
J614
L2
36µ
C19
0.01
TP4
P613
J613
L1
36µ
C18
0.01
TP5
C14
10/16
C15
1000p
R16
3.3k
R15
CR3
1S158
R22
STC
TRIG.
GND
BW
GAIN
9
10
4
8
7
6
5

NOTE: 1. 特記無き抵抗の単位は全て Ω, 1/4W, コンデンサはµF, コイルはH。
ALL RESISTANCE IN OHMS 1/4W, CAPACITANCE IN MICRO FARAD AND INDUCTANCE IN HENRY UNLESS NOTED OTHERWISE.

2. (*)

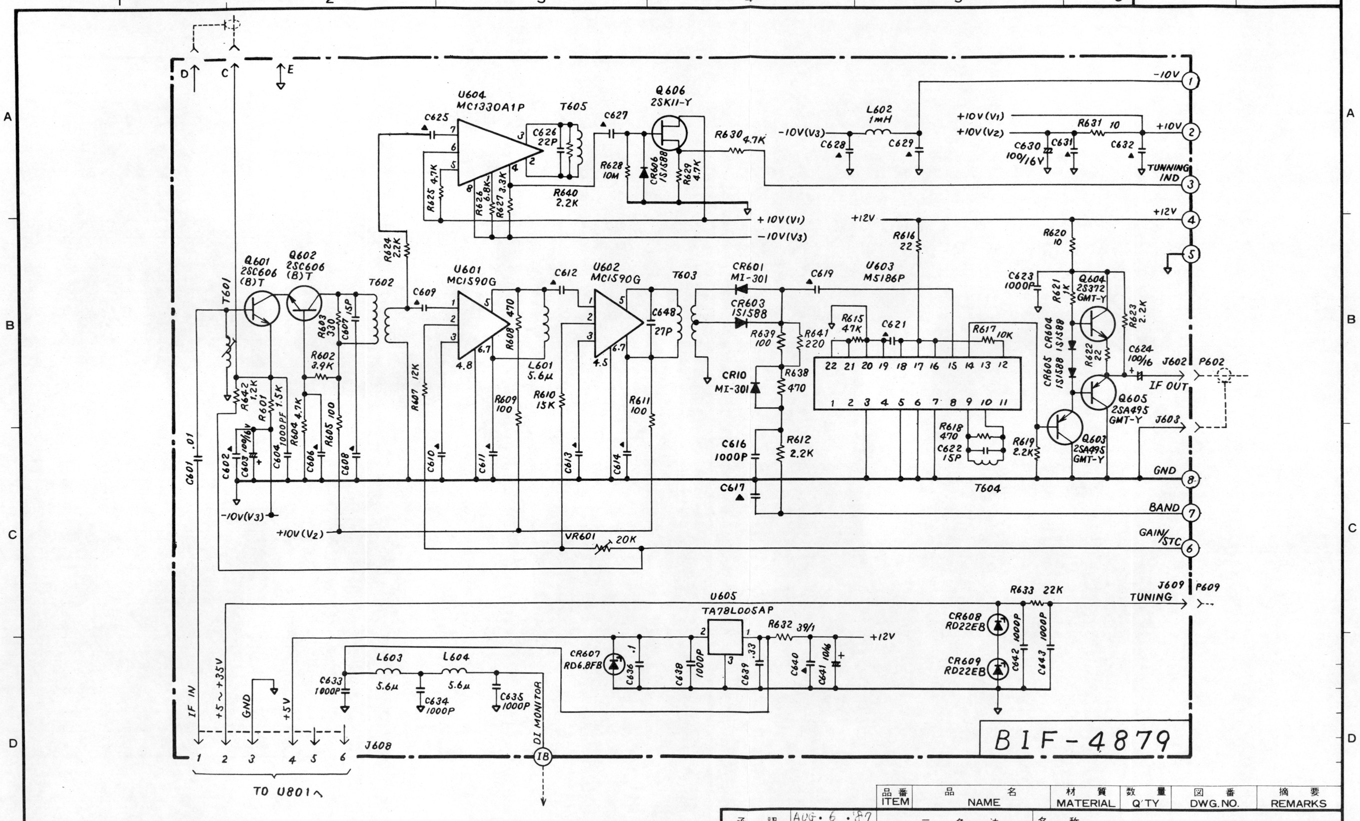
	JUMP 1	JUMP 2	R1	R2	R9	R11	R21	R22	C11	R15	C27
BSTC6995 (D TYPE)	B	B	68Ω	27Ω	8.2kΩ	1.8kΩ	33Ω	——	3300PF	22kΩ	1800PF
ASTC6995 (DA TYPE)	A	A	56Ω	56Ω	6.8kΩ	1kΩ	22Ω	22k	8200PF	——	——

3. コネクタを除く基板内部品の部品番号は700番台。
ADD 700 TO PARTS NUMBER EXCEPT FOR CONNECTORS.

FR-8000D(A) SERIES
FR-1500D(A) SERIES

承認 APPROVED	MAY・21・'87 T.NAKANO	名称 TITLE	ASTC-6995 STC 基板 BSTC-6995 STC P.C.B.
検図 CHECKED	May・21・'87 I. Amano		
製図 DRAWN	May・21・'87 Y. Toniyama	図番 DWG.NO.	C3307-011-C

FURUNO ELECTRIC CO., LTD.


D
C
E
U604
MC1330A1P
T605
C625
C626 22P
C627
Q606
2SK11-Y
R630 4.7K
R625 4.7K
R626 6.8K
R627 3.3K
R640 2.2K
R628 10M
CR606 1S1588
R629 4.7K
-10V(V3)
L602 1mH
C628
C629
+10V(V1)
+10V(V2)
R631 10
C630 100/16V
C631
C632
-10V ①
+10V ②
TUNNING IND ③
+12V ④
⑤
+10V(V1)
-10V(V3)
+12V
R624 2.2K
Q601 2SC606 (B)T
Q602 2SC606 (B)T
T601
T602
C609
U601 MC1590G
C612
U602 MC1590G
T603
C648 27P
CR601 M1-301
CR603 1S1588
C619
U603 MS186P
R616 22
R620 10
C623 1000P
R621 1K
Q604 2S372 GMT-Y
R623 2.2K
R622 22
CR604 1S1588
CR605 1S1588
C624 100/16
J602
P602
IF OUT
Q605 2SA495 GMT-Y
Q603 2SA495 GMT-Y
J603
R603 330
R602 3.9K
R642 12K
R601 1.5K
R604 4.7K
R605 100
R607 12K
R608 470
L601 5.6μ
R609 100
R610 15K
R611 100
R639 100
R641 220
R615 47K
C621
R617 10K
R638 470
CR10 M1-301
R612 2.2K
C616 1000P
C617
R618 470
C622 15P
R619 2.2K
T604
C601 .01
C602
C603 10/16V
C604 1000PF
C606
C608
C610
C611
C613
C614
4.8
6.7
4.5
22 21 20 19 18 17 16 15 14 13 12
1 2 3 4 5 6 7 8 9 10 11
-10V(V3)
+10V(V2)
VR601 20K
GND ⑧
BAND ⑦
GAIN/STC ⑥
J609
P609
TUNING
U605
TA78L005AP
R633 22K
R632 39/1
+12V
CR608 RD22EB
CR609 RD22EB
C642 1000P
C643 1000P
CR607 RD6.8FB
C636 .1
C638 1000P
C639 .33
C640
C641 10/16
L603 5.6μ
L604 5.6μ
C633 1000P
C634 1000P
C635 1000P
IF IN
+5～+35V
GND
+5V
1 2 3 4 5 6
J608
DI MONITOR
⑱
TO U801へ
BIF-4879

NOTE : 1. 特記なき抵抗の単位は全てΩ, 1/4W, ヌコンデンサはμF。
ALL RESISTANCE IN OHMS, 1/4W, AND CAPACITANCE IN MICROFARADS UNLESS NOTED OTHERWISE.
2. ▲ : 0.01μF, 50V

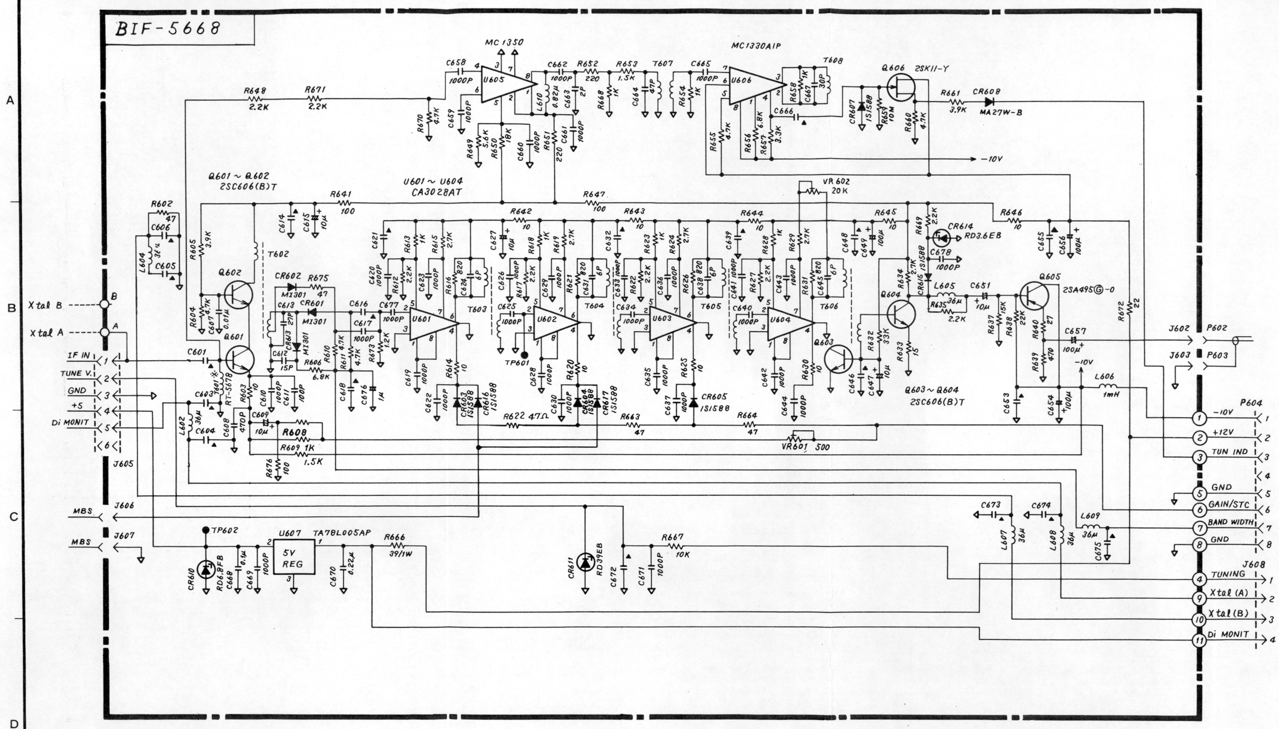
FR-8000D SERIES
FR-1500D SERIES

品 番 ITEM	品 名 NAME	材 質 MATERIAL	数 量 Q'TY	図 番 DWG. NO.	摘 要 REMARKS

承 認 APPROVED	Aug. 6 '87 T. NAKANO	三 角 法 THIRD ANGLE PROJECTION	名 称 TITLE	BIF-4879 IF アンプ IF AMPLIFIER
検 図 CHECKED	Aug. 6 '87 I. Amano	尺 度 SCALE	/	
製 図 DRAWN	'87 Aug. 6 Y. Tomiyama	重 量 WEIGHT	kg	図 番 DWG. NO. C3307-026-D

FURUNO ELECTRIC CO., LTD.

FURUNO


BIF-5668
MC1350
U605
MC1330A1P
U606
Q606 2SK11-Y
CR608 MA27W-B
T607
T608
-10V
Q601 ~ Q602
2SC606(B)T
U601 ~ U604
CA3028AT
VR602 20K
CR614 RD3.6EB
Q605 2SA495Ⓖ-0
Q603 ~ Q604
2SC606(B)T
CR602 M1301
CR601 M1301
T602
T603
T604
T605
T606
U601
U602
U603
U604
TP601
CR605 1S1588
R622 47Ω
VR601 500
R608
Xtal B
Xtal A
IF IN
TUNE V.
GND
+5
Di MONIT
J605
MBS
J606
J607
TP602
U607 TA78L005AP
5V REG
CR610 RD6.8FB
R666 39/1W
CR611 RD39EB
L607
L608
L609
J602
P602
J603
P603
L606 1mH
P604
-10V
+12V
TUN IND
GND
GAIN/STC
BAND WIDTH
GND
J608
TUNING
Xtal (A)
Xtal (B)
Di MONIT

NOTE 1. 特記なき抵抗は全てΩ, 1/4W コンデンサはF, コイルはH。
ALL RESISTANCE IN OHMS 1/4W, CAPACITANCE IN FARADS
AND INDUCTANCE IN HENRIES UNLESS NOTED OTHERWISE.

2. ▲ : 0.01μF, 50V

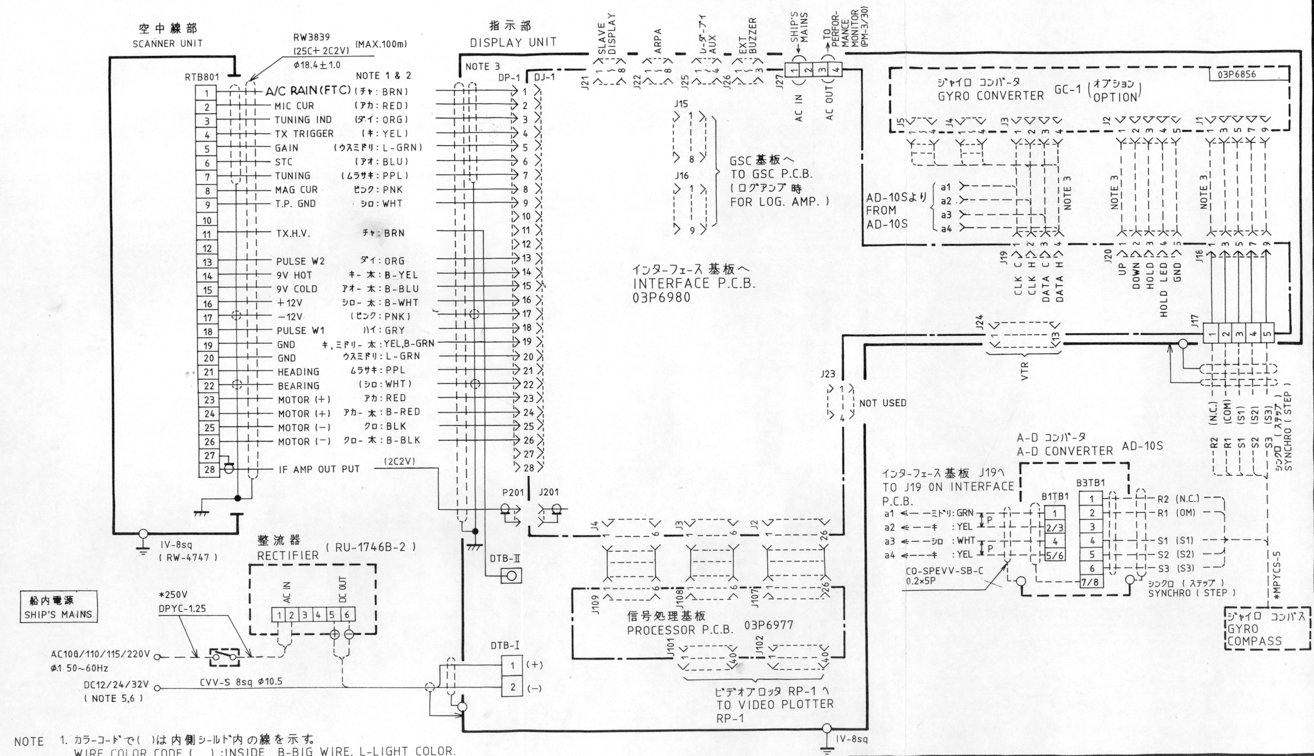
FR-8000DA SERIES
FR-1500DA SERIES

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS

承認 APPROVED	MAY・19・'87 T. NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	IF アンプ IF AMPLIFIER (BIF-5668)
検図 CHECKED	May・19・'87 I. Amano	尺度 SCALE	/		
製図 DRAWN	May・18・'87 Y. Tomiyama	重量 WEIGHT	kg	図番 DWG. NO.	C3307-014-D

FURUNO ELECTRIC CO., LTD.

FURUNO


空中線部
SCANNER UNIT
RW3839
(25C+2C2V)
(MAX.100m)
ϕ18.4±1.0
RTB801
NOTE 1 & 2
A/C RAIN(FTC) (チャ: BRN)
MIC CUR (アカ: RED)
TUNING IND (ダイ: ORG)
TX TRIGGER (キ: YEL)
GAIN (ウスミドリ: L-GRN)
STC (アオ: BLU)
TUNING (ムラサキ: PPL)
MAG CUR ピンク: PNK
T.P. GND シロ: WHT
TX.H.V. チャ: BRN
PULSE W2 ダイ: ORG
9V HOT キ- 太: B-YEL
9V COLD アオ- 太: B-BLU
+12V シロ- 太: B-WHT
−12V (ピンク: PNK)
PULSE W1 ハイ: GRY
GND キ, ミドリ- 太: YEL,B-GRN
GND ウスミドリ: L-GRN
HEADING ムラサキ: PPL
BEARING (シロ: WHT)
MOTOR (+) アカ: RED
MOTOR (+) アカ- 太: B-RED
MOTOR (−) クロ: BLK
MOTOR (−) クロ- 太: B-BLK
IF AMP OUT PUT
(2C2V)
IV-8sq
(RW-4747)
指示部
DISPLAY UNIT
NOTE 3
DP-1
DJ-1
P201
J201
DTB-II
DTB-I
1 (+)
2 (−)
J21 SLAVE DISPLAY
J22 ARPA
J25 レーダーブイ AUX
J26 EXT BUZZER
J27
SHIP'S MAINS
TO PERFORMANCE MONITOR (PM-3/30)
AC IN
AC OUT
J15
J16
GSC基板へ
TO GSC P.C.B.
(ログアンプ時
FOR LOG. AMP.)
インターフェース基板へ
INTERFACE P.C.B.
03P6980
ジャイロ コンバータ
GYRO CONVERTER GC-1 (オプション OPTION)
03P6856
J5
J4
J3
J2
J1
AD-10Sより
FROM
AD-10S
a1
a2
a3
a4
NOTE 3
J19
CLK C
CLK H
DATA C
DATA H
J20
UP
DOWN
HOLD
HOLD LED
GND
J18
J17
J24
VTR
J23
NOT USED
R2 (N.C.)
R1 (COM)
S1 (S1)
S2 (S2)
S3 (S3)
シンクロ (ステップ)
SYNCHRO (STEP)
A-D コンバータ
A-D CONVERTER AD-10S
インターフェース基板 J19へ
TO J19 ON INTERFACE P.C.B.
a1 ミドリ: GRN
a2 キ: YEL
a3 シロ: WHT
a4 キ: YEL
P
CO-SPEVV-SB-C
0.2×5P
B1TB1
B3TB1
R2 (N.C.)
R1 (OM)
S1 (S1)
S2 (S2)
S3 (S3)
シンクロ (ステップ)
SYNCHRO (STEP)
*MPYCS-5
ジャイロ コンパス
GYRO COMPASS
J4
J3
J2
J109
J108
J107
信号処理基板
PROCESSOR P.C.B. 03P6977
J101
J102
ビデオプロッタ RP-1へ
TO VIDEO PLOTTER
RP-1
IV-8sq
整流器
RECTIFIER (RU-1746B-2)
AC IN
DC OUT
船内電源
SHIP'S MAINS
*250V
DPYC-1.25
AC100/110/115/220V
ϕ1 50~60Hz
DC12/24/32V
(NOTE 5,6)
CVV-S 8sq ϕ10.5

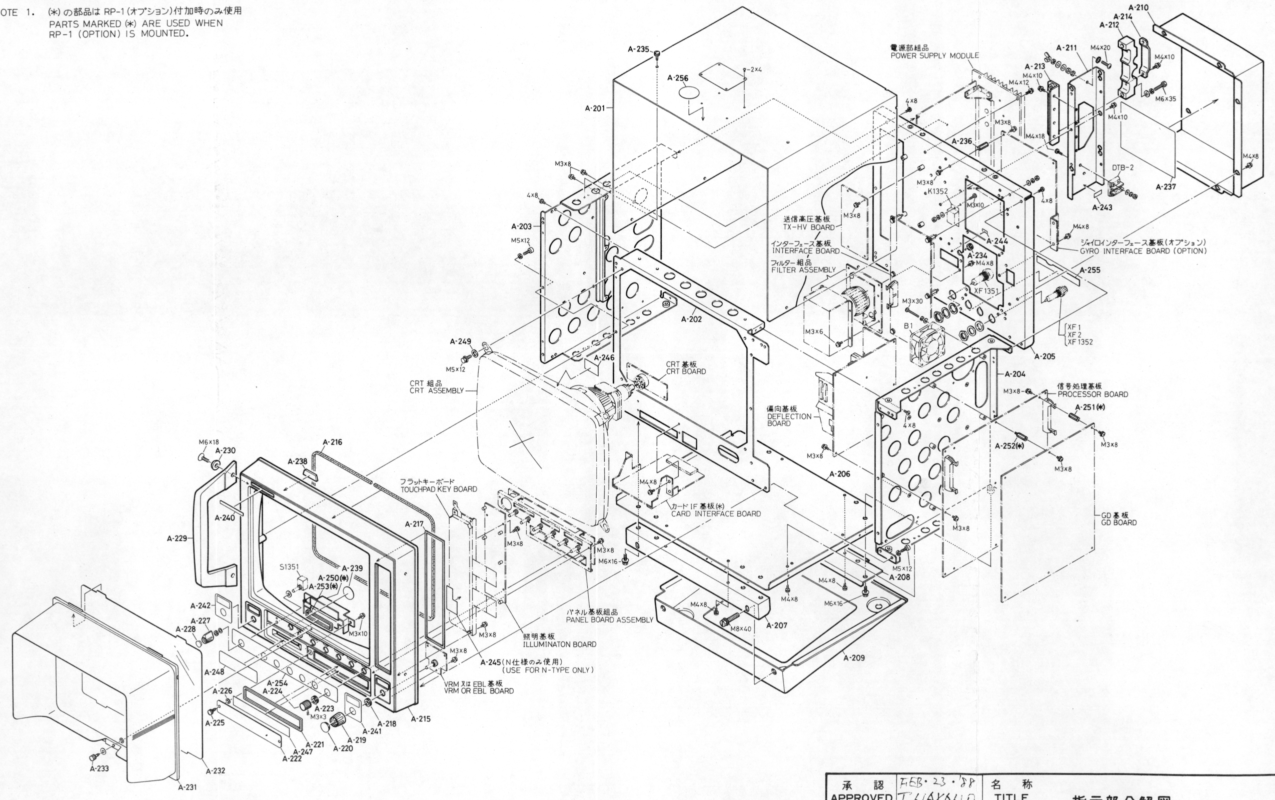
NOTE
1. カラーコードで( )は内側シールド内の線を示す。
WIRE COLOR CODE ( ) :INSIDE B-BIG WIRE, L-LIGHT COLOR.
2. シールドは両ユニット側で完全にアースすること。
SHIELD SHOULD BE EFECTIVELY GROUNDED AT BOTH UNIT ENDS.
3. コネクタプラグ取付済。CONNECTOR PLUG FACTORY-WIRED.
4. ＊: 造船所支給。SHIPYARD SUPPLY.
5. 240cm空中線取付の場合はDC24V電源のみ。ONLY DC24V MAINS FOR 240cm TYPE ANTENNA RADIATOR.
6. FR-1525D(A)の場合DC12V電源は使用しない。DO NOT USE 12VDC MAINS FOR FR-1525D(A).

承 認 APPROVED	JUNE. 17. '87 T. NAKANO	名 称 TITLE	FR-1500D (A) SERIES 相互結線図 INTERCONNECTION DIAGRAM
検 図 CHECKED	June. 17. '87 I. Amano		
製 図 DRAWN	June. 16. '87 Y. Tomiyama	図 番 DWG. NO.	C3307−023−D

FURUNO ELECTRIC CO., LTD.

D-1

NOTE 1. (＊) の部品は RP-1 (オプション) 付加時のみ使用
PARTS MARKED (＊) ARE USED WHEN
RP-1 (OPTION) IS MOUNTED.

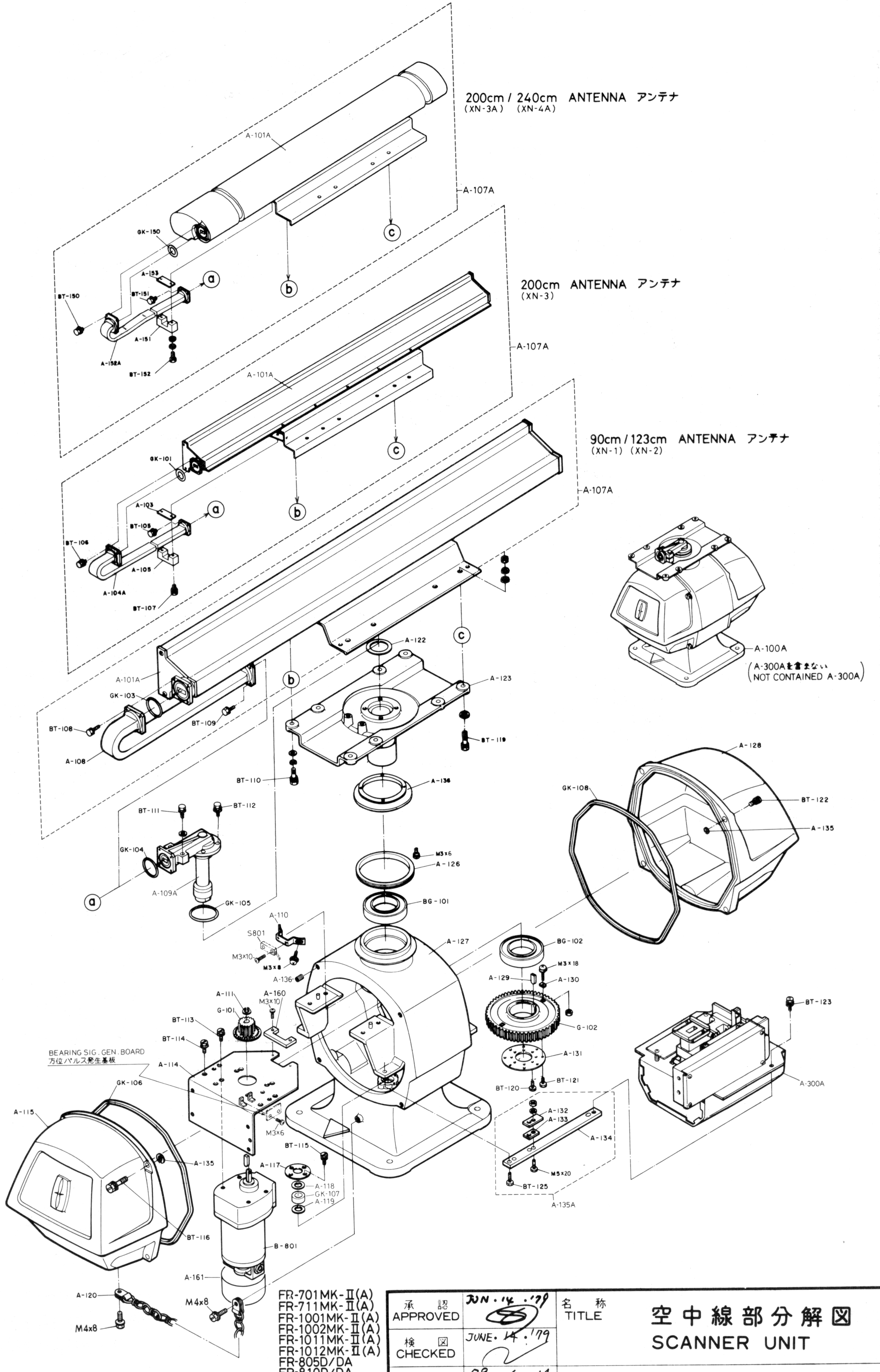


A-235
A-256
φ-2×4
A-201
M3×8
4×8
A-203
M5×12
A-202
A-246
A-249
M5×12
CRT 組品
CRT ASSEMBLY
CRT 基板
CRT BOARD
電源部組品
POWER SUPPLY MODULE
送信高圧基板
TX-HV BOARD
インターフェース基板
INTERFACE BOARD
フィルター組品
FILTER ASSEMBLY
M3×6
M3×30
B1
A-236
K1352
M3×10
A-244
A-234
M4×8
XF 1351
A-213
A-211
A-212
A-214
A-210
M4×10
M4×12
M4×20
M4×18
M6×35
DTB-2
A-243
A-237
M4×8
ジャイロインターフェース基板 (オプション)
GYRO INTERFACE BOARD (OPTION)
A-255
XF 1
XF 2
XF 1352
A-205
A-204
偏向基板
DEFLECTION BOARD
信号処理基板
PROCESSOR BOARD
A-251(＊)
A-252(＊)
GD 基板
GD BOARD
A-206
A-208
M6×16
A-207
M8×40
A-209
カード IF 基板(＊)
CARD INTERFACE BOARD
パネル基板組品
PANEL BOARD ASSEMBLY
照明基板
ILLUMINATON BOARD
A-245 (N仕様のみ使用)
(USE FOR N-TYPE ONLY)
VRM 又は EBL 基板
VRM OR EBL BOARD
フラットキーボード
TOUCHPAD KEY BOARD
A-216
A-217
A-238
A-239
A-250(＊)
A-253(＊)
S1351
M6×18
A-230
A-229
A-240
A-242
A-227
A-228
A-248
A-226
A-254
A-224
A-225
A-223
M3×3
A-221
A-247
A-222
A-220
A-219
A-241
A-218
A-215
A-233
A-232
A-231

FR-1500D(A) SERIES

承 認 APPROVED	FEB・23・'88 T. NAKANO	名 称 TITLE	指示部分解図 DISPLAY UNIT
検 図 CHECKED	Feb・23・'88 I Amano		
製 図 DRAWN	Feb・23・'88 Y. Tomiyama	図 番 DWG. NO.	C3307-032-A

FURUNO ELECTRIC CO., LTD.

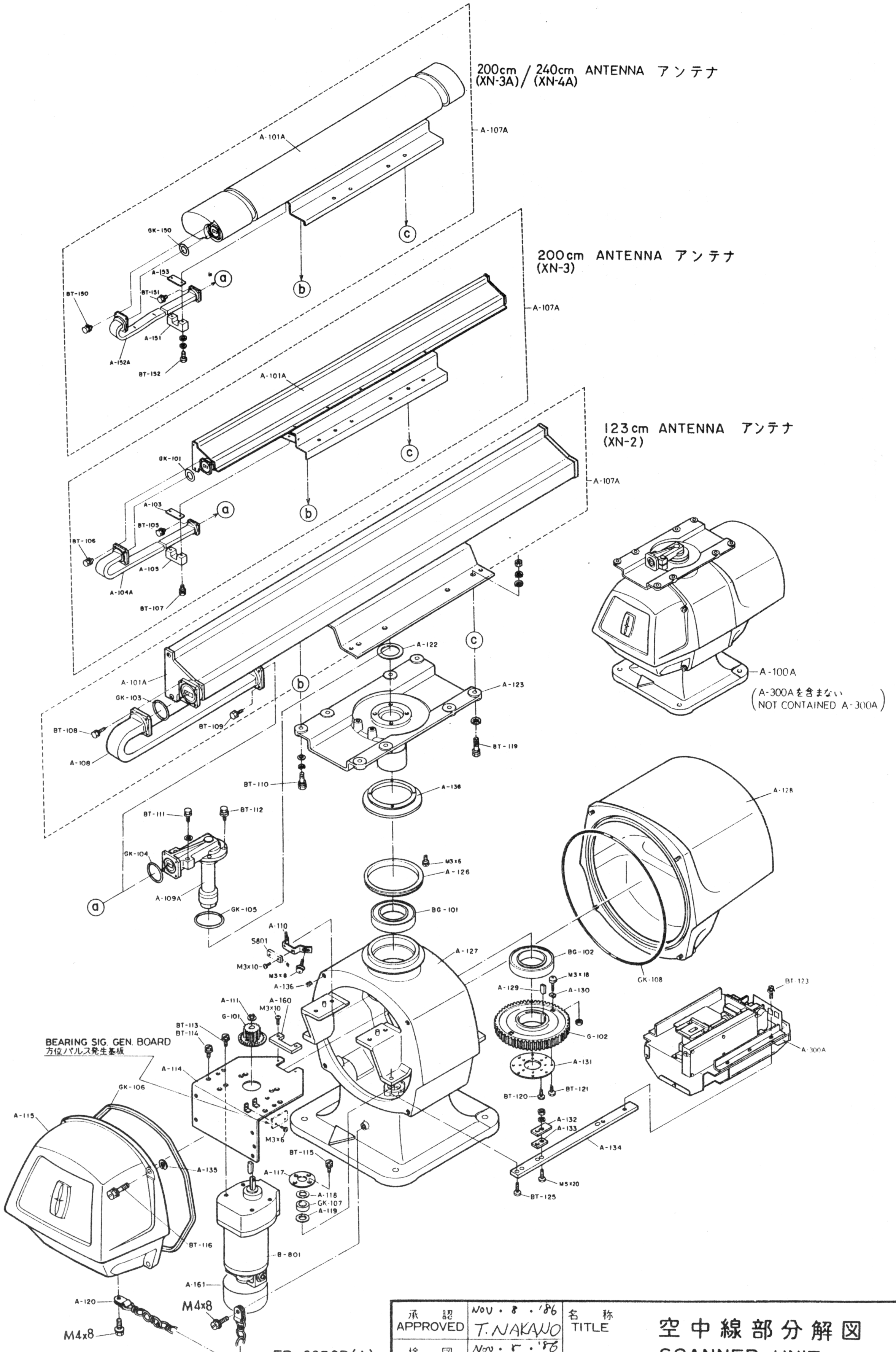

200cm / 240cm ANTENNA アンテナ
(XN-3A) (XN-4A)
A-101A
A-107A
GK-150
A-153
BT-151
BT-150
A-151
A-152A
BT-152
a
b
c
200cm ANTENNA アンテナ
(XN-3)
A-107A
A-101A
GK-101
A-103
BT-105
BT-106
A-105
A-104A
BT-107
a
b
c
90cm / 123cm ANTENNA アンテナ
(XN-1) (XN-2)
A-107A
A-101A
GK-103
BT-108
BT-109
A-108
b
c
A-122
A-123
BT-119
BT-110
A-136
A-100A
(A-300Aを含まない
NOT CONTAINED A-300A)
A-128
GK-108
BT-122
A-135
BT-111
BT-112
GK-104
A-109A
a
GK-105
M3×6
A-126
BG-101
A-110
S801
M3×10
M3×8
A-136
A-127
BG-102
M3×18
A-129
A-130
A-111
A-160
M3×10
G-101
BT-113
BT-114
G-102
A-131
BT-120
BT-121
BT-123
A-300A
BEARING SIG. GEN. BOARD
方位パルス発生基板
A-114
GK-106
A-115
M3×6
A-132
A-133
A-134
M5×20
BT-125
A-135A
A-135
BT-115
A-117
A-118
GK-107
A-119
BT-116
B-801
A-161
A-120
M4×8
M4×8

FR-701MK-Ⅱ(A)
FR-711MK-Ⅱ(A)
FR-1001MK-Ⅱ(A)
FR-1002MK-Ⅱ(A)
FR-1011MK-Ⅱ(A)
FR-1012MK-Ⅱ(A)
FR-805D/DA
FR-810D/DA
FR-1505/1510D(A)
FR-8050/8100D(A)

承認 APPROVED	JUN. 14. '79	名称 TITLE	空中線部分解図 SCANNER UNIT
検図 CHECKED	JUNE. 14. '79		
製図 DRAWN	79. 6. 14 H. Yamaguchi	図番 DWG. NO.	C3276-012-B

FURUNO ELECTRIC CO., LTD.

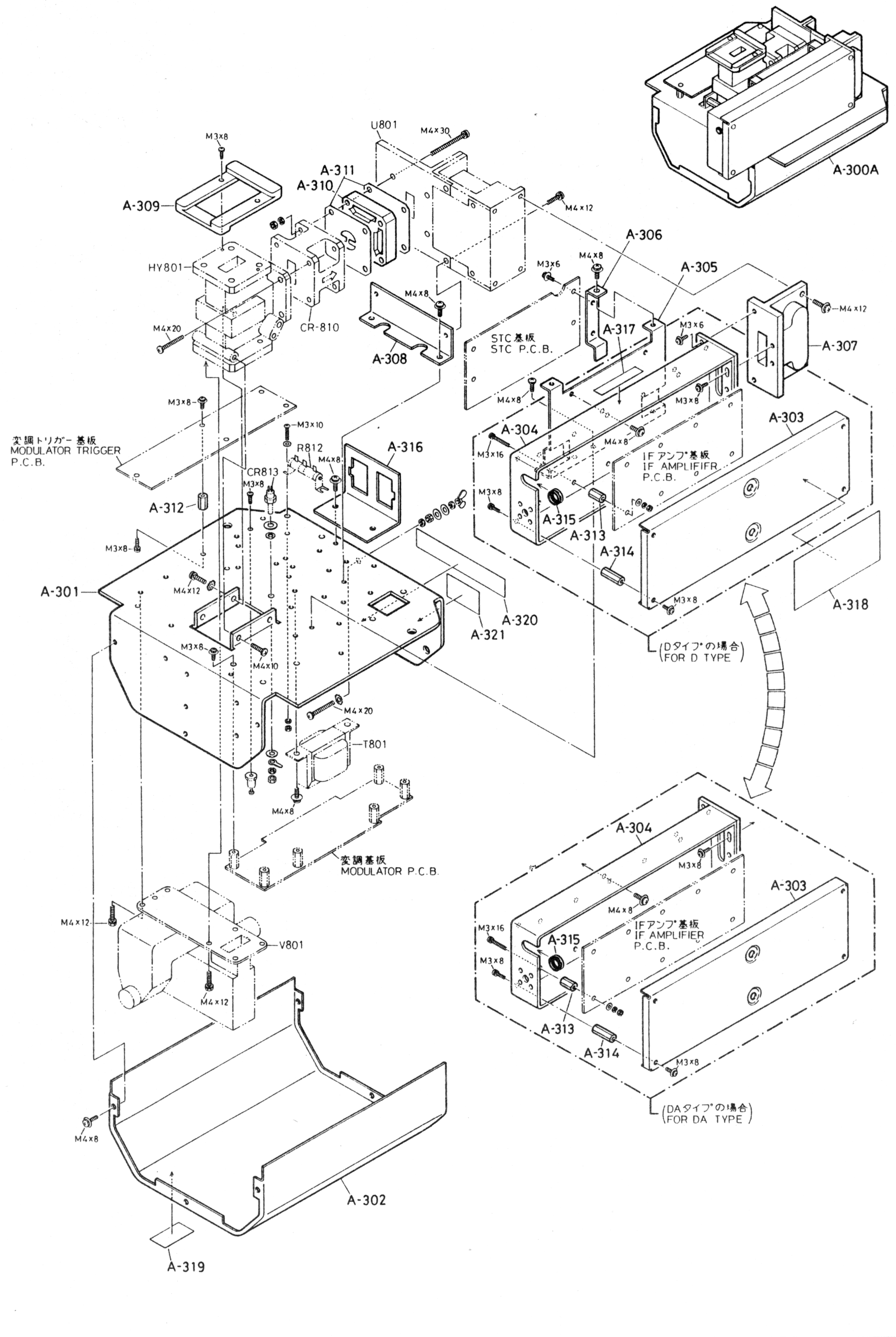
FURUNO


200cm / 240cm ANTENNA アンテナ
(XN-3A) / (XN-4A)
A-107A
A-101A
GK-150
A-153
BT-150
BT-151
A-151
A-152A
BT-152
a
b
c
200cm ANTENNA アンテナ
(XN-3)
A-107A
A-101A
GK-101
A-103
BT-105
BT-106
A-105
A-104A
BT-107
a
b
c
123cm ANTENNA アンテナ
(XN-2)
A-107A
A-101A
GK-103
BT-108
BT-109
A-108
b
c
A-122
A-123
BT-119
BT-110
A-100A
(A-300Aを含まない
NOT CONTAINED A-300A)
A-138
BT-111
BT-112
GK-104
A-109A
GK-105
a
M3×6
A-126
BG-101
A-128
A-110
S801
M3×10
M3×8
A-136
A-127
BG-102
M3×18
A-129
A-130
GK-108
BT-123
A-111
A-160
M3×10
G-101
G-102
A-300A
BT-113
BT-114
BEARING SIG. GEN. BOARD
方位パルス発生基板
A-114
A-131
BT-120
BT-121
GK-106
A-115
A-132
A-133
A-134
M3×6
BT-115
A-135
A-117
A-118
GK-107
A-119
M5×20
BT-125
BT-116
B-801
A-161
A-120
M4×8
M4×8

FR-8250D(A)
FR-1525D(A)
FR- 825D(A)

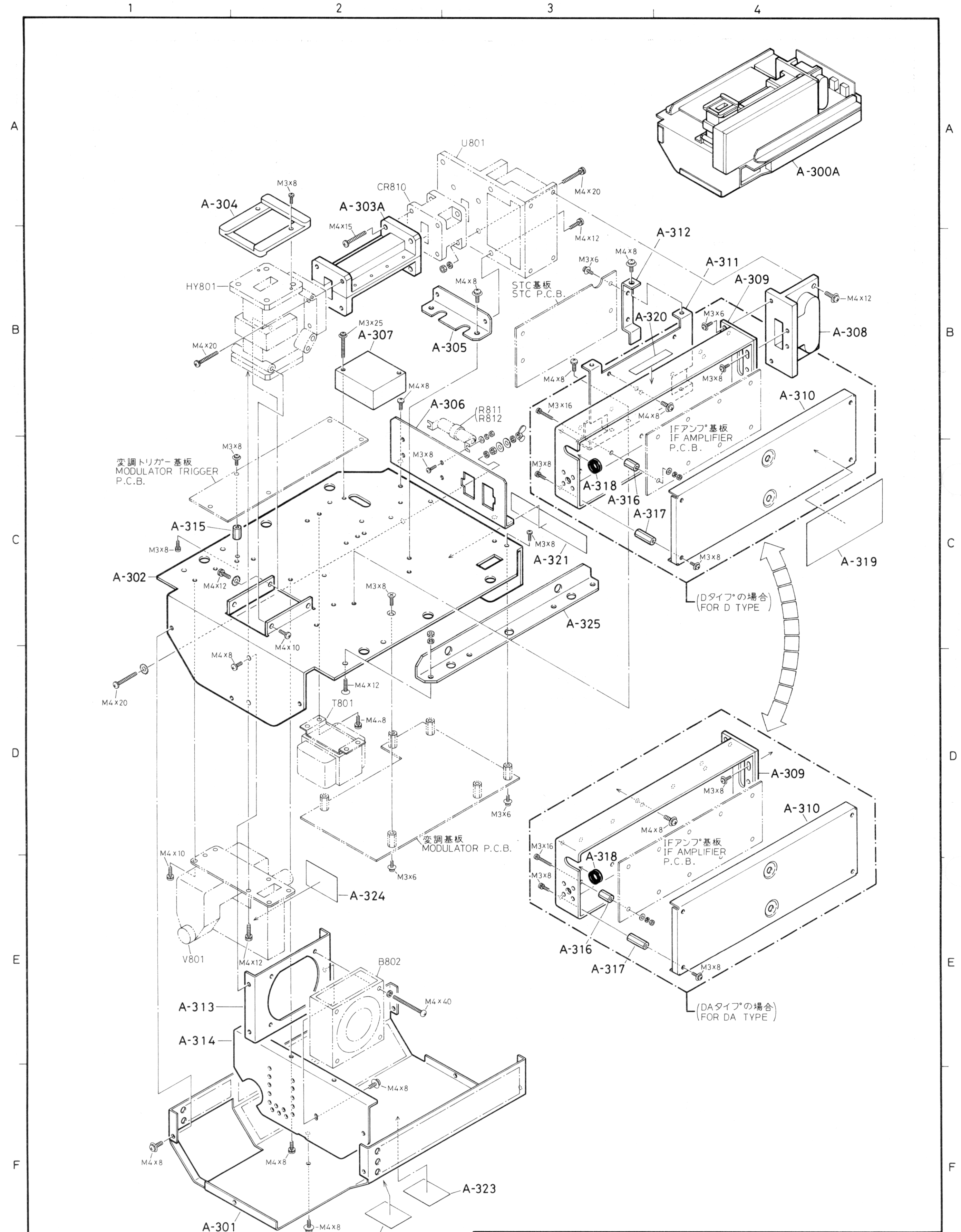
承　認 APPROVED	NOV . 8 . '86 T. NAKANO	名　称 TITLE	空中線部分解図 SCANNER UNIT
検　図 CHECKED	Nov . 8 . '86 I. Amano		
製　図 DRAWN	'86 . Nov . 8 T. Sat	図　番 DWG. NO.	C3290-005-B

FURUNO ELECTRIC CO., LTD.


1
2
3
4
A
B
C
D
E
F
A-300A
U801
M4×30
M3×8
A-311
A-310
A-309
M4×12
HY801
A-306
A-305
M3×6
M4×8
CR-810
A-308
M4×20
STC基板
STC P.C.B.
A-317
M3×6
A-307
M4×12
M3×8
M3×10
R812
M4×8
A-316
A-304
M3×16
IFアンプ基板
IF AMPLIFIFR
P.C.B.
A-303
変調トリガー基板
MODULATOR TRIGGER
P.C.B.
CR813
M3×8
A-312
A-315
A-313
A-314
M3×8
A-301
M4×12
A-320
A-321
A-318
M3×8
M4×10
(Dタイプの場合
FOR D TYPE)
M4×20
T801
M4×8
変調基板
MODULATOR P.C.B.
A-304
M3×8
A-303
M4×8
M4×12
V801
M3×16
A-315
IFアンプ基板
IF AMPLIFIER
P.C.B.
M3×8
M4×12
A-313
A-314
M3×8
(DAタイプの場合
FOR DA TYPE)
M4×8
A-302
A-319

APPROVED	Sep. 13. '88 T. NAKANO	TITLE	送受信部シャーシ分解図 TRANSCEIVER MODULE
CHECKED	Sep. 13. '88 I. AMANO		
DRAWN	Sep. 13. '88 Y. Tomiyama	DWG. NO.	C3307-033-A

FR-1505/1510 D(A)


1
2
3
4
A
B
C
D
E
F
A-300A
U801
M4×20
CR810
A-303A
M4×15
M3×8
A-304
HY801
M4×12
A-312
A-311
A-309
M3×6
M4×8
M4×12
A-308
STC基板
STC P.C.B.
A-320
A-305
M3×25
A-307
M4×20
M4×8
A-306
R811
R812
M3×16
IFアンプ基板
IF AMPLIFIER
P.C.B.
A-310
変調トリガー基板
MODULATOR TRIGGER
P.C.B.
M3×8
A-318
A-316
A-317
A-315
A-321
A-319
A-302
M4×12
M4×10
A-325
(Dタイプの場合
FOR D TYPE)
M4×20
T801
M4×8
M3×6
変調基板
MODULATOR P.C.B.
M4×10
A-324
V801
B802
M4×40
A-313
A-314
A-301
A-322
A-323
(DAタイプの場合
FOR DA TYPE)

APPROVED	Sep. 8 .'88 T. K [illegible]	TITLE	送受信部シャーシ分解図 TRANSCEIVER MODULE
CHECKED	[illegible]		
DRAWN	Sep. 8 .'88 Y. Tomiyama	DWG.NO.	C3307-036-A

FR-1525 D(A)

FURUNO ELECTRIC CO., LTD.

No. 9-52, ASHIHARA-CHO,
NISHINOMIYA-CITY, JAPAN

TELEPHONE : 0798-65-2111
CABLE : FURUNO NISHINOMIYA
TELEX : 5644-325/326 FURUNO J
TELEFAX : 0798-65-4200 (G II /G III)

YOUR LOCAL AGENT/DEALER

553-9171